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VIEWS, NEWS AND INTERVIEWS

A Philadelphia instrument-maker the other day ordered from a large manufacturer of tin boxes in that city a box about two feet cube as a sample. He was surprised when it was brought to his factory by a well dressed gentleman, and asked him why he hadn't sent it by an errand boy.

"Well," said the man, mopping his brow, "I'm a salesman, and it isn't my business to deliver goods this way, but just now we're so busy and full of work that the salesmen are the only idle people in the place. We've got all the errand boys in the shop punching tin. As we don't want any more orders, we salesmen are running errands."

Chicago has demonstrated that the electrical industries are an important factor in her industrial economy. With nearly 1,000 miles of electrically operated street railways, with over 250,000 incandescent lights, 10,000 arc lights and 20,000 horse-power in small motors supplied from central stations and equally as many lights and motors supplied by private plants, and with the best fire and police electrically operated fire and signal system, she ranks as one of the foremost electrical cities of the world.

An interesting incident, combining altruistic sportsmanship and the use of the electric searchlight, occurred during the storm on the night of October 8, when the yachts Columbia and Shamrock were anchored inside Sandy Hook. During the storm it was not only feared that the yachts might drag their anchors, and suffer damage that would interfere with the races, but also that in the heavy weather some incoming vessel would run them down. In this emergency Sir Thomas Lipton ordered that the searchlight of his steam yacht Erin be turned on the Columbia and Shamrock. This was done, and the yachts safely rode out the storm with the searchlight playing on them all night.

The Alumni Association of the Stevens Institute of Technology at Hoboken, N. J., has decided to present to Mr. Andrew Carnegie an interesting token of its appreciation of his donation of $50,000 for the building of an additional laboratory to the institute. The token is a piece of the first T rail used in the construction of railroads in the United States. The T rail was invented by Robert L. Stevens in 1830. Up to that time the flat rail was in use. There being no rolling mills in this country in those days, Mr. Stevens went to England, where his invention was manufactured. Mr. Stevens shipped many tons of the new rails to this country. The first shipment was used on the old Camden & Amboy Railroad, then owned by the Stevens family. Pieces of the old rail are still in possession of the Stevens family, and it is one of these which the Alumni Association will present to Mr. Carnegie. The piece selected is about six inches in length. It will be encased in a handsomely engraved casket, and an appropriate inscription together with certificates identifying the relic will accompany the gift.

A short while ago an electromobile cab service was inaugurated in Philadelphia. A visiting New Yorker invited a native to ride in one of the electromobiles. He declined, and said that a horse cab propelled by a "hay motor" was good enough for him.

The Hotel Netherland, in New York city, has the distinction of having received the first wireless telegram engaging accommodations at a hotel. A spectator of the yacht races aboard the Ponce, on October 5, sent a wireless telegram through the New York *Herald* to the hotel asking the latter to reserve a room for him.

The telegraph receipts of the French Government during the Dreyfus trial were $120,000 more than for the corresponding month a year ago, while the receipts from telephones were $60,000 greater. The official budget estimates from these two sources for that period were exceeded by over $340,000. About 500,000 words a day were sent by telegraph from Rennes.

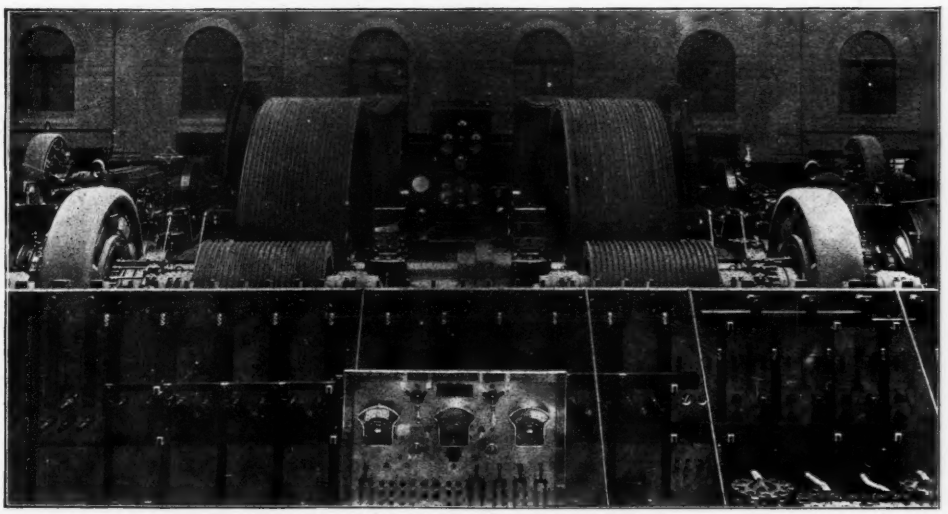


Fig. 1.—General View in Third Avenue Railroad Company's Power House, New York City, Showing Cable Machinery, Synchronous Converters and Back of Temporary Switchboard.

REPLACING A STREET-RAILWAY CABLE SYSTEM WITH ELECTRICITY.

THE PRELIMINARY INSTALLATION IN THE THIRD AVENUE RAILROAD'S POWER HOUSE AT THIRD AVENUE AND SIXTY-FIFTH STREET, NEW YORK CITY.

For some months past the main lines of the Third Avenue Railroad Company, a corporation which controls a very large amount of track mileage in Greater New York, have been the scenes of much difficult work in the transformation of that system to an electric railway of the open-slot conduit class. In the Electrical Review for July 19, 1899, there was described some of the track and conduit work on upper Broadway, in New York city. The majority of the new lines that were under construction are now nearly ready, and it is expected that current will be turned on a number of them very shortly. The 125th street line is already working electrically.

The cable power house at Sixty-fifth street is one of two—the other being at Bayard street—which works the four cables by which the Third Avenue cars, running from the post office to the Harlem River, are operated. It is in this power house that the first temporary electric installation, employing a part of the high-tension three-phase alternating system that is to be used hereafter throughout, is now being installed.

The engine room in which the present cable machinery is at work is a large and lofty room containing four Corliss engines of great power operating a jack-shaft, to which they are belted by rope transmission gear. This jack-shaft in turn drives the cable winding system, which consists of the usual large drums, stretching devices, safety clutches, etc. In the middle of this room there have been placed four

synchronous converters, wound for 550 volts direct current on one side and for equivalent three-phase current on the other. For the present these machines will be used at double-current generators. Their shafts have been extended and an outboard bearing built for each one. On the shaft extension is a grooved drum which will receive a system of driving ropes from a similar drum on the jack-shaft, thus permitting the machines to be driven by the engines which now operate the cable. Current from the direct-current side will be led out on an underground feeder system, and through the temporary low-tension switchboard which stands near the generators, to the nearby sections of the Third Avenue tracks. In the power house at Bayard street, however, and also in that at 130th street and Amsterdam avenue, there are now being installed synchronous converters, identical with those described above. These will be supplied with three-phase current, taken from the alternating-current side of the steam-driven machines at Sixty-fifth street, and stepped up by a bank of stationary transformers to 11,000 volts on each leg. Received at the substations, it will be stepped down again to the proper pressure for operating the converters. When the plans of the company are finally consummated, the station at Sixty-fifth street will be changed over into a substation, the large engines, jack-shafts and other parts of the cable machinery that at present remain being removed to make room for more rotaries.

There is nothing particularly remarkable about the synchronous converters except their size, 1,000 kilowatts, and the fact that they are built more nearly on the lines of direct-current generators than is usual in this type of apparatus; their commutators are notably smaller than those of the majority of rotary converters. Around the face of each pole of these machines a very heavy copper bar is set in order to prevent by its inductive action the tendency of these machines to "hunt" or get into rhythmical interference. The apparatus was built by the Westinghouse Electric and Manufacturing Company, Pittsburgh, Pa.

The 125th street line is now in operation with cars upon one-minute headway, current being taken from a temporary plant consisting of eight 500-horse-power, direct-coupled units.

The work upon this installation, which, upon its completion, will be one of the largest electrical plants in the world, has been done under the supervision of Mr. A. J. Elias, the president of the company, Mr. J. H. Robertson, general superintendent, and Dr. Louis Duncan, chief engineer.

The Street Railway System of Bombay, India.

In reply to inquiries as to the street railway system of Bombay, India, United States Consul William T. Fee says, in a recent report, that the company was chartered by the Bombay Government in 1874, under the name of the Bombay Tramway Company, Limited. It has an invested capital stock of 30 lakhs of rupees, or about $1,000,000, and debentures of about two-thirds that amount. The stock is principally owned in the United States, and its main office is located in New York city. The road is a double-track system, with about 17½ miles in operation. The charter embraces the franchises of the entire city. The road covers the principal business centers, such as the fort district, Girgaum, Byculla, Parel, Mazagon, Grant Road, the railroad terminals and docks. It does not extend to Breach Candy, Malabar Hill, or to any suburb or outlying district.

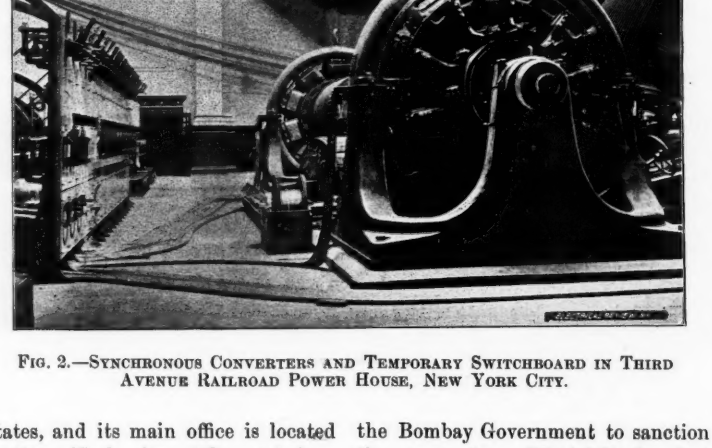


FIG. 2.—SYNCHRONOUS CONVERTERS AND TEMPORARY SWITCHBOARD IN THIRD AVENUE RAILROAD POWER HOUSE, NEW YORK CITY.

It has in use 187 open cars, made by the company in Bombay. It employs 1,150 horses, each of which travels on an average 13 miles daily. They are well cared for and never abused, a sort of a hat or padded bonnet being fastened on top of their heads during the day as a protection against the sun. All animals, in fact, receive humane treatment in India.

About 1,100 men are employed by the company. The car drivers and conductors are paid by the trip, and the former receive about 18 rupees* ($5.85) and the latter 22 rupees ($7.15) per month. The track, barn and common laborers receive the usual Bombay wages of 6 annas (12 cents) per day.

The rails are of the girder type, 30 feet long and weighing 83 pounds per yard. They are laid on teak-wood ties and bedded in concrete. The road was opened to traffic in 1874, and its present cost is estimated at about 35,000 rupees per mile of a single track. The total gross receipts of the road for the last financial year were $398,498, and the operation expenses during the same year were $257,821.

There is now a movement to convert the road into an electric line. In fact, the company has applied to the Bombay Government to sanction the conversion. Electricity has but recently come into use in India, Madras being the only city where it is used on street railways as a motive power.

The rents in the city of Bombay are extremely high. Bungalows rent from $800 to $2,000 per year, and flats without any modern conveniences for from $500 to $1,000 per annum.

The population of the city in the last census in 1891 was 821,764. The density of population in certain parts of the city is very great. In the native quarters, which contain most of the population, it is estimated that there is one human being to every ten square yards of space.

The mortality at present is great, owing largely to the plague with which the city has been infected for the past three years.

In view of these facts, it is hoped that the Bombay Government will speedily sanction the conversion of the present system of the street-car road into an electric line, and that the company will not only extend its service to all parts of the city, but also to outlying and suburban districts, and give the people of this city a service of cheap and rapid transit, thereby providing an outlet, as in many large cities of Europe and America, for its overcrowded quarters, and being of advantage not only financially, but also from a sanitary standpoint.

*The consul estimates the value of the rupee at 32½ cents throughout his report.

AUTOMOBILE NEWS.

The American Motor Mobile Company, of New York, capital, $100,000, has been incorporated at Dover, Del.

Dr. Lehwess, of London, England, is thinking of making a trip in a gasoline automobile from Pekin, China, to London next Spring, when the roads will be in good condition. The machine will be provided with special tanks to carry a supply of gasoline sufficient for several hundred miles.

United States Consul Roosevelt writes from Brussels, Belgium, that a royal decree has approved the resolution of the provincial council of Brabant fixing an annual tax, after January 1, 1900, on automobiles of whatever system. The rate is fixed at 50 francs ($9.65) for an automobile weighing 400 kilograms (880 pounds) or more, and 20 francs ($3.86) for one weighing less.

Judgment for $820 has been entered against the National Motor Carriage Company, of 1 Madison avenue, New York city, in favor of James G. Lynch, for the amount paid on two carriages which were not delivered. Lynch obtained an attachment some time ago, on which the sheriff levied on the office furniture. The company was incorporated under New Jersey laws on August 25, 1898, with a capital stock of $500,000.

The Continental Automobile Company, of New York, has been incorporated at Trenton, N. J., with a capital stock of $8,000,000, of which sum $3,500,000 is 6 per cent preferred stock. The directors are Hon. Anthony Higgins, William H. Bulkeley, William H. Lake, W. H. Nixon, Charles T. Welles, George H. Brown, A. M. Jordan and W. C. Hendrickson. The company has acquired the business of the Winton Motor Carriage Company, Cleveland, Ohio; the Manhattan Oil Motor Company, Jersey City, N. J., and the National Motor Carriage Company, New York, N. Y.

NOTES ON POWER-STATION ECONOMIES.—II.

BY MAURICE HOOPES.

It is very unfortunate that no one has brought out an instrument for indicating the quantity of steam flowing through a pipe at a given instant. Such an instrument as this would be invaluable to every one using steam. It is possible to determine accurately the commercial efficiency of an electric generator at any instant, by measuring the power input and the electrical output at that instant. In order to test the efficiency of a steam engine, it is necessary to make a test extending over some period of time. With an engine it is possible to make instantaneous measurement of the power output, but it is impossible to make a similar measurement of the steam input. In order to determine the quantity of steam used by the engine it must be run for a considerable length of time, and the steam measured by condensing it and weighing it, or by taking it from a steam boiler and weighing the water fed to the boiler. As the error of either one of these methods is very considerable, in order to make it small relatively the test must be of considerable duration. It can be seen that, were it possible to measure the steam supplied to the engine at any given instant, it would be unnecessary to make these long tests. Unfortunately, however, it is easier to conceive of the advantages to be derived from an indicating steam meter than it is to design an instrument to give accurate results.

As was said above there is less liability to change in the efficiency of electric generators than there is in that of steam engines. The efficiency of the engine depends upon correct valve setting and tight valves and pistons, even though it has been properly designed and constructed originally. With a generator there is little opportunity for change from the original efficiency. With an engine there is great opportunity, consequently necessity for much care in maintaining the original efficiency. Of course the most effective means of accomplishing this is that of careful inspection. Periodical tests should be made of valves and pistons to determine the leakage. Inspection of the valve setting and of indicator cards gives satisfaction as to the condition of the valves. With this, however, it is desirable to have periodical tests of the efficiency of the engine. Assuming the efficiency of the generator constant it is possible to make these tests by running the engine and generator, comprising the one unit, through a regular test on constant load. This load can usually be obtained by the use of a water rheostat to dissipate the output of the generator. If the engines are discharged into jet condensers or are non-condensing, it becomes necessary to measure the steam consumption from the boiler feed. It is usually necessary to make such tests at times when the station is shut down, or else to make some provision for carrying the small quantity of load, which exists during the early morning hours when the test may be made, without the steam used for the load entering into the measurement of that used for the test. When everything is taken into consideration, it becomes a rather troublesome matter to get an accurate and satisfactory test of the units of the station. For this reason the operating engineer is not justified in repeating them frequently, but it does seem that it is worth while to get an accurate record of the number of pounds of water used per kilowatt-hour by each unit in the station, at least once a year, and, if possible, twice each year. These tests are quite likely to reveal something that might otherwise have gone undiscovered. Stations usually contain a number of units, each duplicating the other. It would be natural to assume that each of these should give the same efficiency as the others. It will often happen, however, that there will be a decided difference, and often reasons will be found for this difference and remedies applied.

More useful than these periodical tests are the daily results had in a station from recording wattmeters. Modern stations are equipped with wattmeters recording either the output of each generator or that of the whole station. These are accurate instruments when kept in good order; they are, however, very susceptible to influences which result in either temporary or permanent change in their records. As is well known, they must be protected from the influence of exterior magnetic fields. Their accuracy also depends upon the friction of the armature on the jewel and of the commutator being kept a minimum. Subjecting wattmeters to heavy short circuits, as often happens to those in railway power stations, is likely to result in destroying their accuracy. These and a number of other causes make it probable that the wattmeters are varying from a correct record, and require that they be frequently calibrated and corrected. These calibrations are easily made. Usually each wattmeter is in series with an ammeter, which, if it is a good one, may be depended upon to remain practically correct. This ammeter, however, should be calibrated at intervals, which may be very much less frequent than the wattmeter calibrations. In order to calibrate these ammeters, it is necessary for the engineer to have among his instruments a shunted ammeter, the shunt of which can be easily placed in series with the switchboard ammeters. This shunted ammeter can be kept accurate by returning it to the maker, or some laboratory having accurate standards, for comparison. Assuming that the switchboard ammeters are kept correct, the wattmeters may be compared with them by taking instantaneous readings of the ammeters at intervals of, say, five seconds, over a period of two or three minutes. Averaging these give the average current. If the voltage varies more than two per cent or three per cent, it will be necessary to determine the average voltage in the same way, by reading the standard voltmeter, which must be inserted for the purpose of the test. Ordinarily, however, the variations may be neglected, and by watching the minimum and maximum voltages, the voltage half way between, assumed as the average voltage. Where power-station load fluctuations are very great, it may be found impossible to get satisfactory ammeter readings at times of load. If this is the case, the only way the wattmeter can be calibrated is to do it under a rheostat load. Except in very small stations, however, satisfactory readings may be had during times of load. The station wattmeters should be calibrated at least each month, or, preferably, biweekly.

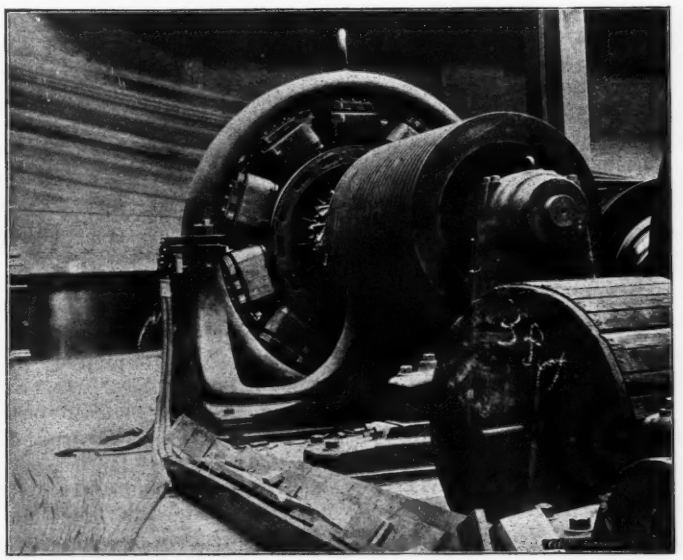


FIG. 3.—SYNCHRONOUS CONVERTER WITH DRUM FOR ROPE DRIVING IN THIRD AVENUE RAILROAD POWER HOUSE, NEW YORK CITY.

With means for measuring accurately each the coal, water and electrical output, the power-station engineer is in a position to determine the precise results of operation of each his boiler room and his engine room. With this information he is able to tell whether or not he is producing his output at as little expense as can be expected, under the conditions that prevail.

If he learns that he is not, he can tell whether the cause of his failure lies in the boiler room or engine room. With this knowledge he has a good start in the search for his trouble. By knowing at all times what he is doing, and especially by getting results daily and acting promptly on them, he is enabled to reach efficiencies of operation that would be quite impossible without the accurate and reliable information that can be had with correct coal scales, water-measuring tanks and recording wattmeters.

Herman Neilson was killed in Brooklyn, N. Y., on September 20 while turning on an incandescent light. A coroner's jury last week returned a verdict to the effect that Herman Nielson met his death through paralysis of the heart, due to an excessive electric shock, and held the Edison Electric Illuminating Company of Brooklyn directly responsible for the young man's death.

SCIENCE BREVITIES.

Cast-Aluminum—Cast-aluminum is about equal in strength to cast-iron in tension, while under compression it is comparatively weak. With a purity of 99 per cent, the ultimate tensile strength of aluminum per square inch is, in castings, 18,000 pounds; in sheet, 24,000 pounds to 40,000 pounds; wire, 30,000 pounds to 55,000 pounds, and in bars, 28,000 pounds to 40,000 pounds. The elastic limit of aluminum of this purity is, for castings, 8,500 pounds; sheet, 12,500 pounds to 25,000 pounds; wire, 16,000 pounds to 33,000 pounds, and bars, 14,000 pounds to 23,000 pounds per square inch. Taking tensile strain in relation to weight, pure aluminum is as strong as steel of 80,000 pounds per square inch.

Becquerel Rays—Herren Elster and Geitel have made another attempt to discover the origin of Becquerel rays, but again without success, says an abstract in the *Electrician*. Thinking that the radiation might be influenced by the impact of cathode rays, they exposed a piece of pitch blende from Joachimsthal to cathode radiation, and determined whether that produced any difference in the Becquerel rays It did not. Nor could any influence of temperature be demonstrated. The authors believe the Becquerel rays to be Roentgen rays of small intensity, and they render this very probable by two further analogies which they have discovered. A magnetic field not only increases the resistance of a partial vacuum, but it also retards the discharge of an electrified body provoked by the impact of either Roentgen rays or Becquerel rays. An obvious explanation would be that the Becquerel rays are deflected by a magnet; but when the rays were made to produce a bright patch on a fluorescent screen no magnetic field could displace that patch.

Electrolytic Solution Pressure—In a note on this subject before the late meeting of the British Association, Dr. R. A. Lehfeldt discussed the theory of electrolytic solution pressure, in which he stated that, according to Nernst's theory, when a metal is immersed in an electrolyte a minute amount of it goes into solution in the ionic form, giving a positive charge as the liquid as compared with the metal, or ions from the solutions are deposited in metallic form, giving the metal a positive charge according as the osmotic pressure of the ions in solution falls short of or exceeds an amount known as the electrolytic solution pressure. This view had been generally adopted by physical chemists, it being supposed that the amount of metal to be deposited or dissolved was too small to measure. By combining the calculated value of the solution pressures with the known theorems of electrostatics on the tension exerted by electric charges, it might be shown, in the case of zinc at least, that the amount dissolved would be some centigrammes per square centimetre immersed, and could be easily weighed. Hence the theory seemed to break down.

Conductivity of Lead Peroxide—Peroxide of lead, when used as a coherer substance, shows the peculiar property of decreasing in conductivity under the influence of electric waves. This property has hitherto been held to disprove Lodge's theory of the coherer, based upon the formation of conducting chains by the welding together of successive particles Herr T Sundorph has studied the behavior of this substance, and found that a cell containing PbO_2 powder transmitted a current of 8.5 milliamperes to begin with, says one of Mr. E. Fournier d'Albe's abstracts. After two minutes' exposure to electric waves, the current was reduced to 6 25 milliamperes, and after twenty minutes to 5 milliamperes. At the same time, the amount of PbO_2 was slightly reduced, but the author does not seem to have been able to find the reason of this reduction. The only clue he gives is that PbO_2 contains some moisture, and this, of course, might be evaporated by the sparks. But whatever change takes place seems to be confined to the neighborhood of the terminals, and the positive pole becomes hotter than the negative pole.

Reenforced Concrete — Armored concrete, that is to say, concrete in which a layer of steel or iron rods is embedded, has of recent years been largely adopted on the Continent, and experience has conclusively shown that the resistance of the concrete mass to fracture is increased in a really extraordinary degree, says *Engineering*. A rational explanation of this augmentation of strength has, however, been wanting, the rules used in proportioning hitherto having been purely empirical. Some recent investigations of M. Considére go far, however, to fill this void, his experiments having specially designed to demonstrate the real nature of the assistance rendered by the metal reenforcement. Beams of armored concrete were accordingly subjected to pure bending, shear being eliminated, and their behavior carefully watched. It was thus shown that the tension surface of such reenforced beams was capable of taking a stretch without fracture fully eight times as much as the stretch at rupture of quite similar beams of unstrengthened concrete. This fact was confirmed by experiments in direct tension. Here the stretch of an armored rod was twenty times as great as that corresponding to the fracture of simple concrete rods. It would thus appear that the adhesion of the concrete to the iron is so strong that the two materials work together as one. The weakest section of the concrete, therefore, can not yield, since it is held together by the iron, and thus no cracks are observed even when the total stretch is many times that sufficient to rupture concrete pure and simple. The tests further show that cracks only make their appearance when the metal inside is strained up to its elastic limit. These facts would seem, therefore, to admit of the calculation of the strength of such reenforced concrete being put on a rational basis. Knowing approximately the elastic modulus of concrete it becomes possible to fix the position of the neutral axis, and thus to proportion the whole, so that the compressive stress on the concrete shall not exceed the ordinary safe limit, whilst at the same time the quantity of metal used on the tension side of the beam is such that the stress on it is kept well below the elastic limit.

Luminous Rings in Rarefied Gases—In a paper before the British Association, Mr. C. E. S. Phillips describes some remarkable and beautiful investigations of the phenomena of vacuum tubes. The apparatus used consisted of an approximately spherical glass bulb, the ends of which were left open for the purpose of inserting two soft iron electrodes, half an inch in diameter, through air-tight flanges, which themselves were cemented to the glass. The bulb was about 2½ inches in diameter, and the electrodes were chosen of a sufficient length to enable them, while almost meeting at the center of the bulb, to project outwards slightly beyond the rims of the flanges. A side tube was attached for the purpose of connecting the apparatus to a Sprengel air-pump and McLeod vacuum gauge. Two powerful electromagnets were then adjusted so as to strongly magnetize the electrodes when necessary. A low pressure having been produced in the bulb by the action of the air-pump, leading wires were attached to the iron electrodes to enable the discharge from the secondary of an induction coil to be passed through the rarefied gas. Under these conditions the effects produced in the usual glow discharges by the magnetization of the electrodes could be conveniently examined. It was seen that, at a pressure represented by 0.008mm. of mercury and with the discharge just able to pass in the bulb (the magnets meanwhile remaining unexcited), on shutting off the current from the induction coil and completing the magnet circuit a luminous ring appeared within the bulb in a plane at right angles to the lines of force and in rotation about the magnetic axis. The number of such rings can be varied by special devices, and their brightness largely depends upon the electrostatic condition of the outer surface of the glass bulb. The circumferential speed of the ring or rings rapidly dies down, and the sense of the rotation reverses when the magnetic polarity of the electrodes is reversed. The rings, when once formed, usually last for many seconds, sometimes for a minute, and then momentarily brighten before disappearing, when the electrodes cease to be magnetized. The appearance of the rings is greatly affected by bringing charged bodies up to the outside of the bulb. The effect also depends upon the manner of stimulation of the rarefied gas within the bulb. It is necessary to obtain a particular distribution of charged particles in order to get the best results when the magnet is excited. The shape of the magnetic field is also of importance. A single magnetic electrode projecting into the electrified gas shows the effect fairly well. Experiments with external magnetic electrodes have not given reliable results, the glow produced in such cases being generally irregular.

CABLE NEWS.

The Secretary of War has denied the application made some time ago, of the Commercial Cable Company, to land a cable in Cuba.

The Commercial Cable Company announced last week that cipher messages for Cape Colony, where a censorship has been established, will not be accepted. It also says that the Portuguese administration announces that secret language is prohibited in private telegrams to and from the Azores and Madeira.

Velocities of Electro-Magnetic Waves in Air and Along Wires.

At a recent meeting of the Société Internationale des Electriciens, M. C. Gutton presented a paper on the above subject, of which the following is a translation:

In 1857 Kirchhoff showed for the first time that an electro-magnetic disturbance of short duration propagates itself along a metallic wire with a velocity equal to that of light. Maxwell, in 1865, had deduced from his theory that electro-magnetic waves should propagate themselves in air with the same speed. The older theories, however, at this time led to the belief that the effects of induction were transmitted instantaneously from one point to another. The discovery by Hertz of a method of obtaining regular electrical oscillations, having a period of less than a thousand-millionth of a second, led to the direct experimental confirmation of the results of Kirchhoff and of Maxwell. In 1889 Hertz showed that electric waves move through the air with a finite velocity. Illness prevented the completion of the experiments which he had undertaken to show the equality of the velocity of propagation in air and along wires.

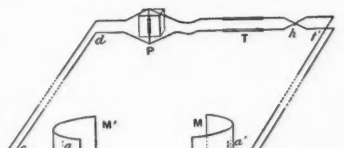
MM. Sarasin and de la Rive put this equality of speed beyond possibility of doubt, and finally M. Blondlot determined the numerical value of the velocity, and showed that it was equal to that of light.

The discovery of M. Branly (the coherer) having put into the hand of the physicist an exceedingly sensitive apparatus for studying electric waves, I undertook to use a tube of filings to verify the equality of velocities in a method different from that of former experimenters. I will briefly describe here the celebrated experiments executed in 1892–93 at Geneva by MM. Sarasin and de la Rive. These gentlemen first established the fact that a resonator responds to a particular wave-length, which depends entirely upon its form and dimensions and not upon those of the exciting apparatus. With this datum they started on interference experiments analagous to those of Hertz, with the aim of determining the wave-length of a given resonator. They first allowed to impinge upon it waves propagated along two parallel wires and reflected from their extremities; afterwards waves in air reflected back by a large plane mirror. By moving the resonator along the wires, or along the normal to the center of the mirror, the sparks at the indicating gap of the instrument went through a series of maxima and minima. The half wave-length of the resonator is measured in such cases by the distance between two consecutive positions for which the spark is either maximum or minimum. Now, since the period of oscillation of the resonator and the speed of propagation are related in a very simple way to the wave-length, these experimenters found that the wave-length is precisely the same in air or when the wave goes along the wires. From this it is deduced that the speed of propagation is equal. The majority of the experiments were made with a circular resonator 75 cm. in diameter, which had a fundamental wave-length of about 6 m. This could be measured to within about 15 cm., giving a probable error of not more than $\frac{1}{40}$.

The method that I have employed permits the direct comparison of the propagation without going through the intermediary of the resonator, and permits the direct verification of the fact that the waves require the same time to cover the same course whether through the air or along a conductor.

Two systems of waves are started simultaneously from an exciter. One is propagated along a copper wire while the other makes a part of its journey through the air.

The two systems of waves arrive at the same coherer, which is so arranged that if the waves strike it together their action will be to mutually interfere and extinguish one another. The length of the paths can be adjusted until there is no action upon the coherer, which shows that then the two systems of waves take the same time to reach the tube from the exciter. Then the air space may be filled, if desired, with a rectilinear copper wire, and it will be seen that the action upon the coherer is still the same. The disposition used in the experiments is shown by the diagram herewith. The source of waves is at *E*, and consists of two rods of brass 3 cm. long and 6 mm. in diameter, and gives waves about 17 cm. long. The principal spark strikes between these two rods in vaseline oil. The exciter, like that of Righi, is charged by two leading in sparks, which burst in the air. Current is furnished by a small coil, of which the mercury interrupter is operated by hand. This exciter is placed on the focal line of a parabolic cylindrical mirror *M* of 7 cm. focus. The waves are concentrated by a second mirror *M'*, identical with the first, upon two copper wires *a* and *b*, 8 cm. long, placed upon its focal line. The opposing extremities of these are connected to two copper wires which are stretched parallel and close together, and which traverse the mirror and conduct the waves up to the bridge *P*.



Apparatus for Comparing Wave Velocities in Wires and Air.

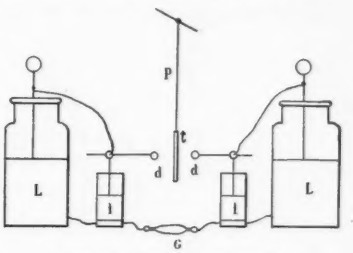
On the other hand, a second system of waves is received by two wires *a'* and *b'* parallel with the exciter inside the first mirror, and these are led by a line of wire, similar to the others, also to the point *P*, which is common to both. This line is crossed, so that the waves arriving by it will be in an inverse sense to those crossing the air-space between the mirrors, and arrangements are provided at *T* for adjusting its length, in order to extinguish the indications of the coherer at *P*. The coherer used is a glass tube 3.5 cm. long and 1.4 cm. in diameter, filled with small watch screws. The use of these little screws for making not very sensitive but exceedingly regular coherers was suggested by M. Drude. The coherer was connected up in the usual way with a battery and a Deprez-d'Arsonval galvanometer. When the distance between the two mirrors is varied it is found that the length of the copper wire line must be proportionately altered, and as it is comparatively easy to measure the lengths of these wires and the air-space with great accuracy, a result certainly less than one-half of one per cent in error has been reached. Of course, the same apparatus could be used for determination of the ratio of velocities of these waves in air and other dielectrics, and a sheet of one of these placed between the two mirrors and the necessary adjustments made would give data for an exceedingly simple calculation of the required ratio; in other words, of the index of refraction of the substance.

Surveys have been made for an electric road, eighteen miles in length, to be constructed by the Lynchburg & Wartrice, Tenn., Railway Company. A bonus of $20,000 has been raised in Moore County to aid the construction. Contracts will be let at once.

An Interesting Leyden Jar Experiment.

To the Editor of Electrical Review:

The sketch herewith illustrates an arrangement I have made to obtain the gradual discharge of Leyden jars or batteries, and which very beautifully illustrates some of the phenomena of static electricity. The small Leyden jars *ll* are those of a Wimshurst influence machine, and *LL* are larger jars connected with them to increase the total capacity of the system. The outer coatings of the opposite pairs of jars are connected with a Geissler tube *G*. Between the discharge knobs *dd* was suspended a piece of cardboard shown at *t* in the figure, which was covered with tinfoil on both sides, the two sides being in electrical connection with each other. This is hung up pendulum fashion on a strip of paper *p*, hanging from a wire as shown. Under these circumstances, when the jars are charged to a point such that they will not quite spark across the distance *dd*, the swinging tinfoiled card is attracted by one of them; charged, repelled and attracted to the other, where it is discharged—neutralizing a part of the electricity of that system—recharged, and this is kept up continuously, the pasteboard oscillating rapidly from knob to knob. Meanwhile, at every oscillation, the electrical balance between the jars is maintained by a discharge, first in one direction and then in the other, through the Geissler tube *G*, which flashes synchronously with the swinging pendulum. The frequency of this action can be increased by adjusting the discharge knobs *dd* closer together, or by using a lighter and thinner pendulum arrangement. The size of the tinfoil *t* also bears an important part in this matter, as the larger it is the more its capacity and the more quickly the jars are discharged.



An Interesting Leyden Jar Experiment.

Alfred G. Dell.

Baltimore, Md., October 5.

Local capitalists are arranging to build a paper mill and an electric road at Rothchields, five miles from Wausau, Wis., where there is a water-power.

Electrical Review

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News, Subscriptions and Advertisements.

SPECIAL NOTICE TO ADVERTISERS.

CHANGES for advertisements must be in this office by Friday noon for the following week's issue. NEW ADVERTISEMENTS should be in the office not later than Saturday noon to insure publication the following week, although it is occasionally possible to get in matter received on Monday.

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LONG-DISTANCE TELEPHONY.

The conquest of distance by the telephone has been gradual, an achievement of years of patient effort towards the betterment of all the parts of the telephone itself and the lines traversed by its currents. In no essential particular is the telephone of to-day radically different from that of ten years ago. The feats of long-distance telephony accomplished daily are due wholly to careful attention to the minutiæ of lines and instruments.

It has been thought that the telephone repeater, if such a thing is ever produced, is the greatest desideratum in its particular field. The limit of commercial telephony is undoubtedly about reached by the long line in the United States, at least under the present system. The construction of a line between New York and San Francisco, for example, while perhaps physically possible, would certainly be commercially impracticable. It has been thought that with repeaters it might be made successful—provided that a repeater could be made.

The offer of a million dollars for a successful repeater was a very safe one. The current wave flowing from a transmitter is not by any means a literal and faithful analogue of the sound wave that gave rise to it. The wave forms of vocal sounds are highly complex, and it is likely that those of the transmitter current are equally so, though different. Superposed upon the fundamental tone are countless harmonics of shorter period, varying in character and intensity. This complicated jumble of waves goes out on the line where it encounters not only resistance, tending to diminish the energy of each wave, but also inductance and capacity tending profoundly to modify the character and form of the waves. And this effect is not exerted equally upon the waves of various frequencies that are superposed to make the telephonic current, but differently upon each of the many components of that highly complex whole. Hence the character of the current is changed. The high-frequency harmonics that give quality and distinction to vocal tones, reproduced with amendments by the transmitter, are further curtailed here and amplified there, until the wave arriving at a distant point is widely different from that which started from the transmitter.

If the receiving point is not too distant and if the effects of capacity and induction are not too marked, and if the transmitter is of sufficient energy, conversation may be carried on. But if the first two of these conditions are not met no repeater whatever could better matters. At best a perfect repeater could only send out on one side a wave exactly like that entering it on the other, but of greater amplitude. This would in no way affect the modifying action of the line on the form of the wave.

For this reason it is hard to see why the effort to make a telephone repeater is not wasted time. What is needed is a line in which the effects of capacity and induction are reduced to an absolute minimum. Resistance is, for long-distance work, a minor consideration. Capacity is the chief enemy of the long distance telephone.

The present municipal administration of New York city is making strenuous efforts for the cause of municipal ownership of such public service utilities as street railways and lighting plants. Whether or not municipal ownership is a good thing depends, first and foremost, on the municipality; but if it proves bad there is no remedy easy of application. In Great Britain there have been some successful experiments in municipal operation of street car lines, but on a very small scale in comparison with the systems in vogue in American cities, while there have been some conspicuous failures. The friends of the idea often quote Glasgow as an example of a city in which the street railways have been successfully worked by the municipality, but they overlook London, where the County Council has been in conflict with its employés for a long time, and where the general public is as much disgusted with municipal car lines as it is with municipal telephones. The question is finally one of intelligence and honest management.

One of our esteemed contemporaries recently brought out a number intended for foreign circulation, in which abstracts of the articles included in its reading pages were printed in various languages. Among these was alleged French. It was intended, evidently, that French readers might glance over the abstracts before tackling the long reading articles. One of them, here literally translated—grammar and spelling—shows what entertainment an enterprising American publisher can provide for foreign readers:

"One of the principal pointes of the fêtes at the honor of Admiral Dewey has been the employment of electric lighting as decorations. There has been employed to this effect some electric energy which mounts itself to several thousands of dear. Or the bridge of Brooklin *hint* thousand incandescent lamps of 16 landles weure arranged of manner to produce the words 'Welcome Dewey.' These lamps were arranged by series of *cing* on a circuit of 500 volts."

The extraordinary flexibility of a combined direct-current feeding system and alternating-current supply is well illustrated in the temporary plant of the Third Avenue Railroad Company, described on another page of this issue. The synchronous converter is a most remarkable combination machine, since it can be used either for its legitimate purpose of transformation between alternating and direct current, or as a motor for either variety of current, or a generator for either variety, or both. In the new installation these machines will be used in substations for their legitimate purpose and in the larger station as double-current dynamos.

Advance reports from the convention of the American Street Railway Association, now in session at Chicago, seem to indicate that the meeting will be one of the most interesting and profitable in the history of the association. The discussions are upon subjects of primarily technical interest to street railway men, and less than usual will the papers read invade the domain of the engineering arts.

BRITISH ELECTRICAL NEWS.

[*From our special correspondent.*]

I think I told you last week how the tramcars at Dublin forgot themselves and created a prejudice against the good cause which they represented; though I also hinted that the old Adam in me sympathized with the tramcars. Well, the Board of Trade sent down one of their best qualified Inspectors to adjudicate upon their conduct (the conduct of the tramcars, I mean, not that of the excellent gentlemen who compose the Board—it is only in the French Army that officers are permitted to criticise their superiors). Mr. Trotter was the Inspector selected; his inquiry was held with all due formality; and both sides were represented by counsel and experts. But it was the old story—the mountains were in labor, and the offspring was an absurd little mouse. The tramcars came off with flying colors. A few defects, incident to a new installation, were admitted, but it was shown that they had been rectified, or were in a fair way to be so; the gentleman who could not distinguish between a trolley-rope and a bell-pull obtained exactly as much sympathy as he deserved; the Lord Mayor's coachman did not appear; the doctor who examined the "injured" persons testified that their suffering did not extend beyond "mental shock," while an "injured" carman drove the "injured" persons to the hospital, and then returned to console himself with another fare. The one witness who was really injured in a tramway accident arrived too late to be present at the inquiry, and complained to a free and enlightened Press about it, after the manner of unpunctual folks. His experience was clearly unique, and it was a pity, therefore, that his evidence could not be taken. Mr. Trotter afterwards inspected the tramway system, and complimented the gentlemen concerned in its management upon its manifold perfections, and then withdrew into official darkness again. The incident is affording excellent "copy," and a patriotic Press is crying aloud that the imperfections of a trolley head are not credited until the head of a citizen has been broken to demonstrate the fact—surely a strange complaint from men who are descended from the heroes of Donnybrook, where heads were certainly not rated at a high figure. More characteristic was the attitude of the Gas Manager, who stepped out before his fellow-countrymen with the assertion that the gas flame which interfered in the last accident was not more than eighteen inches long, and could not, therefore, have exploded. You see, the good old custom of trailing your coat-tails around and challenging all and sundry to step upon them has died out in these degenerate days, and one has to keep it in spirit, if at all. The spirit of the Gas Manager's interposition is quite in accordance with the best traditions of his race.

The real event of the week has been the inauguration of the Plymouth Electrical Works. Plymouth is one of our oldest as well as one of our most important seaports; circumstances have compelled it, for its own sake, to keep up to the foremost mechanical knowledge of the day throughout its long and honorable past; and it is only in accord with the fitness of things that one of the finest electrical plants in the country should be installed here. This is the first installation in the country which has combined lighting and traction work from the start, and the prices charged for current are the cheapest yet charged at the inception of an electrical scheme over here. All this and more was pointed out in the orthodox luncheon at the Guildhall, which terminated the ceremony of inauguration, and one of the contractors, Mr. Ferranti, made a happy hit by observing that whereas it was from Plymouth that the Pilgrim Fathers had sailed some 300 years since for America in the *Mayflower*, it is from their descendants in that country that some, at least, of the dynamos used in this installation had been obtained.

Something is being done at last to improve our telephone service over here. Years ago it was delivered over to a private company, which has bled the public freely upon it ever since, insomuch that rates in England are three and four times as high as those charged for a superior service on the Continent. Public discontent gathered slowly, but last year a committee of the House of Commons was appointed to look into the matter, which reported strongly against the National Telephone Company, and recommended that competition should be permitted. The company had incurred a considerable personal (if I may use the word in regard to a company) unpopularity; it had been oppressive and tyrannical in its dealings with the public; the temper of their lady employés was not above reproach; and altogether it may be said that the British Public thirsted for its blood. At one time the desires of the public seemed in a fair way to be gratified. The government introduced a bill in Parliament, with a great flourish of trumpets, which was to authorize competition and generally to set matters upon a freer footing, and the public hailed it with applause. But the vested interests were too strong for them. The shareholders of the company formed a compact and powerful body in the House; "lobbying" was unblushingly resorted to, and in the event the government was forced to yield helplessly the main safeguards of the company's monopoly; so that little has been gained beyond a promise that the government will establish a competing service in London. The company, meanwhile, has just announced some minor concessions in the provinces, but it may be taken as certain that the question is not yet finally shelved. The telephone industry in this country has been effectually strangled for years, and it can not be supposed that the public will take its beating lying down, and make no further attempt to gain its liberty in this important respect. Hitherto the telephone in England has been the rich man's luxury only; sooner or later it must be made accessible to all.

London, October 7, 1899.

PERSONAL.

Mr. J. F. Stevens, president of the Keystone Electrical Instrument Company, of Philadelphia, paid a brief visit to New York city last week.

Mr. J. G. White, of J. G. White & Company, engineers and contractors, of New York city, returned home last week on the Oceanic, after a trip of several weeks in Europe.

Mr. Guido Cemenza, chief engineer of the Central Electric Light and Power Company, of Milan, Italy, is visiting the United States and inspecting electric plants in various parts of the country.

Mr. Seizo Misaki, chief engineer and superintendent of the Hashin Electric Railway Company, of Kobe, Japan, is traveling through the United States inspecting electric railway plants in the interest of his company.

Mr. Frank Julian Sprague and Miss Harriet Chapman Jones were married at the home of the bride's parents, Captain and Mrs. Henry R. Jones, at Hillview, New Hartford, Ct., on October 11. The ELECTRICAL REVIEW extends its congratulations.

IN CHICAGO.

AMERICAN STREET RAILWAY ASSOCIATION IN CONVENTION—FIRST DAY'S PROCEEDINGS — EXCELLENT ATTENDANCE OF RAILWAY MEN — A FINE EXHIBITION — SOME ABSENTEES.

[*Special Dispatch to* ELECTRICAL REVIEW.]

CHICAGO, October 17, 1899.

In her own inimitable "I will" manner, Chicago has planned and well arranged all details of the street railway convention. She will send the delegates, manufacturers and supply men home from the eighteenth annual convention of the American Street Railway Association in a frame of mind to tell the stay-at-homes that this has been one of the most largely attended, most royally entertained and satisfactory meetings ever held by the street railway interests. Chicago desired to have a little larger display of street railway apparatus, a little more bunting and more big and little men present than ever before. She is apparently accomplishing all, although there is an absence of several leading manufacturers due to crush of business at home.

The attendance of the managers and superintendents of street railway companies is quite representative. I just saw a delegate from a town in Utah with sombrero and cowhide boots, whose road operates a total of four cars, grasp in fellowship the hand of the president (in evening dress) of a system operating 1,400 cars. This spirit of good feeling pervades.

Arrangements beneficial to manufacturers are most complete. In fact the fourth day is free from sessions of the convention and the exhibiting manufacturers and supply men will on that day receive full attention and be repaid for the elaborate exhibits they have brought here at considerable expense and trouble. "Tattersall's," the largest exhibition building in Chicago, is completely utilized, and the exhibits show many practical developments.

The ELECTRICAL REVIEW is the only weekly with offices in the exhibition.

President Charles S. Sergeant came on with a Boston contingent, and registered early Monday. On the same day quite a delegation arrived

(*Concluded on page 255.*)

THE BIRTH OF ELECTRICAL SCIENCE.*

BY SIR MICHAEL FOSTER.

If there be one word of science which is writ large on the life of the present time, it is the word "electricity"; it is, I take it, writ larger than any other word. The knowledge which it denotes has carried its practical results far and wide into our daily life, while the theoretical conceptions which it signifies pierce deep into the nature of things. We are to-day proud, and justly proud, both of the material triumphs and of the intellectual gains which it has brought us, and we are full of even larger hopes of it in the future.

At what time did this bright child of the nineteenth century have its birth?

He who listened to the small group of philosophers of Dover, who in 1799 might have discoursed of natural knowledge, would perhaps have heard much of electric machines, of electric sparks, of the electric fluid, and even of positive and negative electricity; for frictional electricity had long been known and even carefully studied. Probably one or more of the group, dwelling on the observations which Galvani, an Italian, had made known some twenty years before, developed views on the connection of electricity with the phenomena of living bodies. Possibly one of them was exciting the rest by telling how he had just heard that a professor at Pavia, one Volta, had discovered that electricity could be produced not only by rubbing together particular bodies, but by the simple contact of two metals, and had thereby explained Galvani's remarkable results. For, indeed, as we shall hear from Professor Fleming, it was in that very year, 1799, that electricity as we now know it took its birth. It was then that Volta brought to light the apparently simple truths out of which so much has sprung. The world, it is true, had to wait for yet some twenty years before both the practical and the theoretic worth of Volta's discovery became truly pregnant, under the fertilizing influence of another discovery. The loadstone and magnetic virtues had, like the electrifying power of rubbed amber, long been an old story. But, save for the compass, not much had come from it. And even Volta's discovery might have long remained relatively barren had it been left to itself. When, however, in 1819, Oersted made known his remarkable observations on the relations of electricity to magnetism, he made the contact needed for the flow of a new current of ideas. And it is perhaps not too much to say that those ideas, developing during the years of the rest of the century with an ever-accelerating swiftness, have wholly changed man's material relations to the circumstances of life, and at the same time carried him far in his knowledge of the nature of things.

* Extract from the Presidential Address before the British Association.

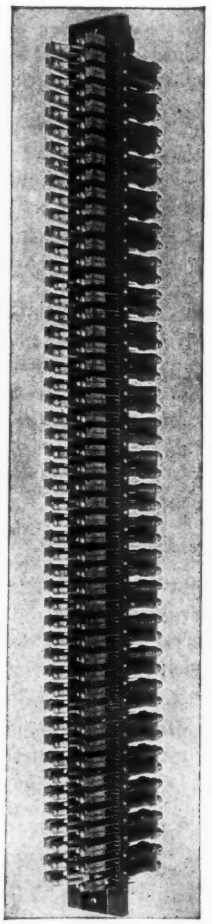


FIG. 1.—TELEPHONE HEAT COILS.

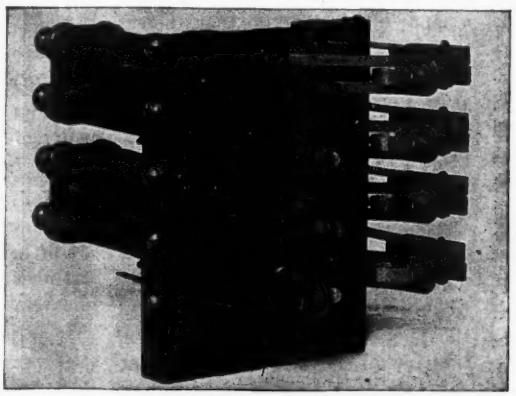


FIG. 2.—A TELEPHONE HEAT COIL UNIT.

OUR CANADIAN LETTER.

REVELSTOKE, B. C.—The council will establish an electric fire-alarm system.

VICTORIA, B. C.—Tenders will be invited at once for enlarging the civic electric light station.

MANITOWANING, ONT.—B. H. Turner is preparing to introduce a local telephone system.

THOROLD, ONT.—The Electric Light Committee has been empowered to purchase a new transformer.

ERIN, ONT.—The question of installing an electric light plant is being considered by the citizens.

OTTAWA, ONT.—The contract will be let this week for the Britannia extension of the Ottawa Electric Railway.

MONCTON, N. B.—It is said that negotiations are under way looking to the extension of the street railway.

COATICOOK, QUE.—The Coaticook Electric Light Company are putting down the foundation for their power house.

SHELBURNE, ONT.—Tenders for lighting the streets for a term of ten years are invited by H. C. Dunbar, clerk.

CHATHAM, ONT.—Mayor Smith is negotiating with eastern capitalists for the construction of an electric railway in this city.

ST. MARY'S, ONT.—Dr. McGorman wants tenders for wiring and fixtures for electric lighting of church 80 by 60 feet with basement.

OTTAWA, ONT.—The Ottawa Power Company has been formed, with a capital of $250,000. A. W. Fraser and M. C. Eddy are interested.

VICTORIA, B. C.—The construction of a tramway line to the Gorge, 1½ miles from the Soanich road, will be commenced about October 1.

EDMONTON, N. W. T.—The machinery of the electric light company was recently damaged by a flood to the extent of several thousand dollars.

WESTON, ONT.—In connection with the proposed electric light plant, it is intended to buy the old mill site and deepen 600 feet of the tail race.

ST. HYACINTHE, QUE.—The St. Hyacinthe Electric Railway Company is seeking incorporation to build an electric railway, telephone and telegraph lines and bridges.

MIDLAND, ONT.—The present contract for electric lighting expires at the end of the year, and the question of the renewal will be taken up at an early date by the council.

ST. CATHERINES, ONT.—A project for an electric railway from this city to Wellandport, *via* Fonthill and Petham, is under consideration. Buffalo capitalists are interested.

NIAGARA FALLS, ONT.—Steps are being taken to rebuild the powerhouse of the Niagara Falls Park & River Railway. It is found that three of the dynamos are but little damaged.

SUSSEX, N. B.—The Sussex & Hammond Telephone Company is seeking incorporation to build a telephone line from Sussex to Jeffrey's Corner and other places. O. P. King and R. B. Harmer are interested.

SARNIA, ONT.—David Mackenzie, representing the Sarnia Electric Railway Company, has informed the council of the willingness of the company to proceed at once with the construction of an electric railway.

ARNPRIOR, ONT.—At the last council meeting a proposition was submitted by J. E. Askwith and other Ottawa gentlemen, to construct waterworks and sewerage systems for the town and supply electric lighting.

ST. CATHERINES, ONT.—The Niagara Central Railway is about to be extended to Port Dalhousie, the company having decided to proceed with the work at once. The existing line will be converted into an electric road.

STURGEON FALLS, ONT.—The Sturgeon Falls Pulp Company have asked for a further loan of $12,000, in return for which it is agreed to renew the electric light contract, to put in a telephone system and to construct a waterworks system.

ST. JOHN, N. B.—J. F. Wilson, city electrician, has recommended improving the fire-alarm system, consisting of putting the wire in seven circuits, with non-interfering boxes, at approximate cost of $7,000. A special meeting of the council will consider the matter.

QUEBEC, QUE.—As soon as the works of the Canadian Electric Light Company are completed it is the in-

tention to operate the Chaudière Valley Railway Company by electricity. Other lines will be constructed in the counties of Levis, Dorchester, Bellechasse and Lotbiniére.

PORT ARTHUR, ONT.—The Electric Railway and Light Commissioners have recommended to the council to authorize the installation of a water plant at Current River, the plant to be of a capacity of 300 horse power, divided into 200 horse-power for lighting and 100 horse-power for railway purposes, at a cost not exceeding $5,000.

PORT STANLEY, ONT.—The Port Stanley Electric Railway Company have applied to the Ontario Government for a charter to built an electric railway from Port Stanley to St. Thomas and London. Should the charter be granted it is proposed to commence the work at once. The London & Port Stanley Gravel Road Company are the promoters.

J. A. C.

Montreal, October 4.

New Devices for Protecting Telephones.

In the development of apparatus for telephone exchanges, nothing has received so much attention from telephone engineers as the problem of practical and efficient methods of protecting expensive equipment from the inroads of currents that might be damaging either to the central office equipment, telephone or cable. At first protection was offered only against lightning discharges, but during the last few years various devices have been introduced for shutting out and grounding high-tension and "sneak" currents, which are so often found on telephone lines because of crosses with other lines carrying electric light or power currents. Within the last few months an equipment has been brought out, which is claimed to automatically control these currents without the use of apparatus partially destroyed every time a "sneak" current enters the line. Fuses and fusible coils have been the usual means adopted, but the North Electric Company, of Cleveland, has now brought out a system which grounds the lines affected without the burning out or destruction of any of the equipment. The grounding of foreign currents is brought about by the use of a heat coil, which is both non-fusible and non-inductive, grounding the line automatically, and restoring the telephone line to its normal condition as soon as the line is opened at the cable box.

This apparatus is of interest because of economy, in that no portion of the apparatus has to be replaced, and further, in that the inspector is relieved of all trouble arising from fusing of coils or fuses by lightning discharges. With this equipment, the inspector is required to repair the lines only in the case of fuses being blown by high-tension currents. In the cable box the regular spool fuse is used; the system of protection at the office is said to enable the use of a fuse at the cable box of far greater carrying capacity than is possible with any other equipment.

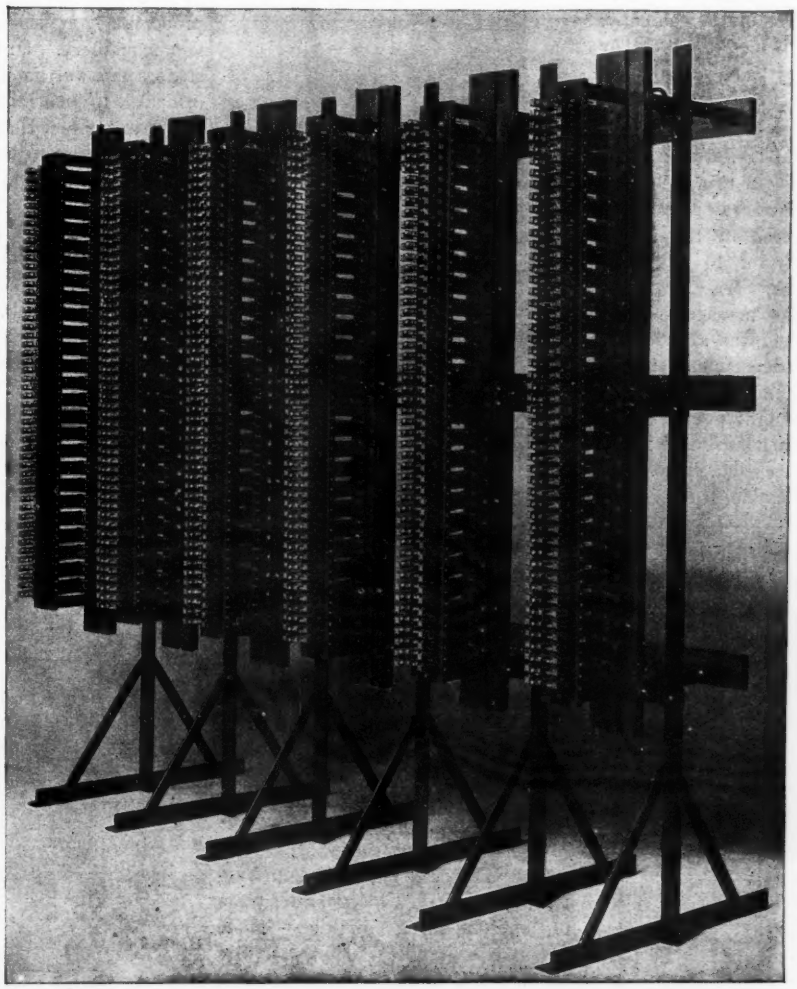


FIG. 3.- NEW DEVICES FOR PROTECTING TELEPHONES.— AUTOMATIC CUTOUTS MOUNTED ON RACK.

The illustration, Fig. 3, herewith shows an automatic cutout mounted on angle-iron rack with 300 pairs installed. In combination with this rack is the cross-connection feature which is mounted in such a way that there is no danger from fire. It is claimed that this arrangement of cutout apparatus connected with the cross-connection feature is thoroughly elastic, being applicable for use in either small or large exchanges, and being built on the lines recommended and endorsed by the leading telephone experts and engineers of the day.

Fig. 1 shows the method of assembling these heat coils in strips ready for mounting on the angle-iron rack. This strip shows 50 pairs installed. They are also assembled in strips of 100 pairs for large exchanges. Fig. 2 shows the heat coil units (three quarters full size) and the method of mounting them, together with the automatic contact which cuts out the drop while at the same time cutting the line to ground.

An important feature of this equipment, which will appeal to all managers having in mind the expense of installing an exchange, is the fact that expensive office terminals for the cables are not needed. With this form of office protection the manufacturers recommend the use of what is known as the flexible joint. Another important feature in connection with this system is the arrangement for testing which makes this board effective either for testing to the switchboard or to the outside lines, and combining terminals, cross-connection rack, lightning-arrester and high-tension current protector and testing board are all in one mechanism.

It is claimed that this automatic cutout arrangement, in connection with the system which the makers offer for protecting cables on the poles and telephones at substations, forms the most perfect system of protection which is offered to the telephone field. It is stated that this is the only system which is entirely automatic in its operation, and which does not involve the expense of replacing the parts at any time that lightning discharges or foreign currents come into the exchange.

W. T. Runals, Dr. F. A. Everhard and W. B. Foster are at the head of a movement to run an electric line from Ripon, Wis., to Green Lake.

Toll-Line and Small Exchange Telephone Apparatus.

In the middle western part of the United States there is a rapidly growing network of toll-lines connecting towns of small size, in each of which is operated a telephone exchange, which, in the nature of things, can have but few subscribers. The aggregate of the telephone business done in this way is very large, but the conditions under which it is carried on require special types of apparatus. The illustrations herewith show a variety of telephonic apparatus especially designed for work of this character by the Central Telephone and Electric Company, of St. Louis.

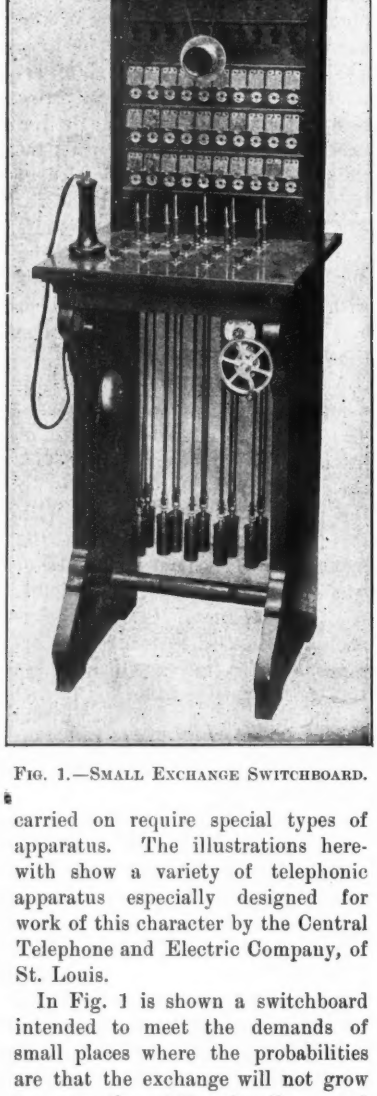


FIG. 1.—SMALL EXCHANGE SWITCHBOARD.

In Fig. 1 is shown a switchboard intended to meet the demands of small places where the probabilities are that the exchange will not grow to more than 100 subscribers, and where economy must be the first consideration. As may be seen, the drops and jacks are arranged in rows of ten each on shelves fitting a frame, and the number may be increased at any time by another shelf-full of ten. The construction of the parts is very simple and solid, the design having been made with a view to the use of the apparatus by persons not familiar with electricity.

Figs. 2 and 3 show toll-line switchboards. Fig. 2 is intended for two bridging lines or for two series lines, and has a combination ringer and drop. Fig. 3 is made for ten short-series lines ending in drops and five long-series lines, extension bells with a variety of sounds to indicate which is which being used on the latter. Fig. 4 shows the standard type of telephone set made by the company, the transmitter being supported by an arm which may be adjusted either horizontally or vertically.

New Rail Bonds.

About the newest things in rail bonds for electric railway use are the special types offered by the Morris Electric Company, of 15 Cortlandt street, New York. Mr. Elmer P. Morris, the active manager of the company, some months ago decided to add a bond department to his already extensive line of railway supplies, and has brought out an assortment of types which have met with a most gratifying reception. The Morris solid one-piece flexible bond is well enough known to speak for itself. In addition, the new Morris extra-flexible bond is now on the market and is bound to become popular among the more careful of railway engineers, who desire to bond their tracks in such manner as to have the least possible electrical resistance with the greatest possible flexibility of bond, so that no matter what the vagaries of weather, the track-circuit will be all right at all times. The extra-flexible bonds will be furnished of any type required in practice, either for use under or outside the fish-plates and of any capacity up to 500,000 circular mils. Two such bonds are equal in carrying capacity to any eighty-pound rail, so that engineers now have a chance to bring their bonding work up to the ideal condition, when the bonds supply all the carrying capacity of the rails themselves. This ideal condition has never yet been attained in construction work, and the Morris Electric Company deserves credit for supplying engineers with the means of reaching the goal.

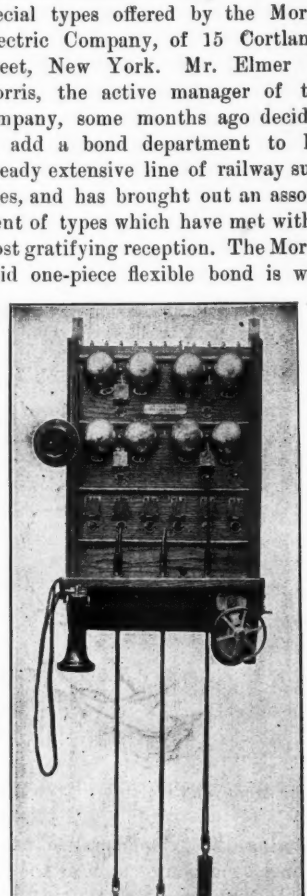


FIG. 2.—TOLL-LINE BOARD.

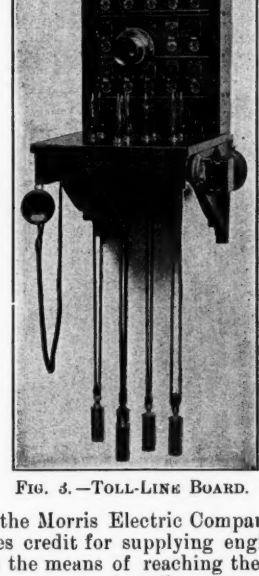


FIG. 3.—TOLL-LINE BOARD.

The company is well represented at the Chicago convention, and we predict for it handsome returns in the way of orders for the Morris bonds.

A New Multiple Telephone Switchboard.

The Western Telephone Construction Company, of Chicago, after years of experimenting in high-grade multiple switchboard apparatus, are offering to submit drawings and estimates on their up-to-date line of apparatus, governed by patents owned and controlled by them. The following are a few of the features of their multiple switchboard: New rapid-circuit changer; three distinct movements of the operator's hand connects two parties together; busy test eliminating the annoyance as well as the objection of the battery click. It is claimed to be a most rapid and complete system. This company's product is stated to be perfect before leaving the factory, no experimenting being necessary after the apparatus is installed. They guarantee all of their product to be the best that skill and long experience can produce, and claim to be the oldest independent manufacturers of telephone equipment in the United States.

Wall Street and the Electrical Stock Market.

From a speculative standpoint the week has been confusing. The most recent development, of course, is the British–Boer war, and its influence on the money market of the world. As far as the export trade of the United States is concerned with the Transvaal, the situation is not serious. The last report of our exports to this territory showed the annual amount to be about $15,000,000, of which a large proportion was electrical apparatus and machinery. Under the circumstances this war, no doubt, will prove of benefit to American manufacturers, owing to the fact that the home market is prepared to take anything the electrical or machinery industries make.

On the New York Stock Exchange General Electric closed the week at 117 bid and 118½ asked, a loss of 1 point for the week. Metropolitan Street Railway, of New York, closed at 191 bid and 192 asked, a loss of 5⅛ points for the week. Third Avenue Railroad, of New York, closed at 147 bid and 152 asked, a loss of 2 points for the week. Brooklyn Rapid Transit closed at 80⅞ bid and 81 asked, a loss of 7¼ points for the week.

On the Philadelphia Exchange Electric Storage Battery common closed at 124½ bid and 128 asked, a loss of 2 points for the week. Union Traction closed at 37⅝ bid and 37¾ asked, a loss of 1¾ points for the week.

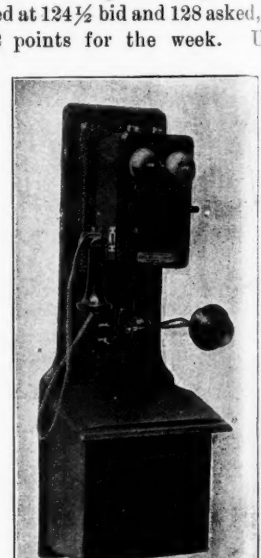


FIG. 4.—TELEPHONE SET.

On the curb or outside market in New York Electric Vehicle closed at 75 bid and 82 asked, a loss of 5 points in the bid price for the week. Electric Boat closed at 17 bid and 20 asked, a loss of 2 points for the week.

Wall Street, October 14.

New Types of Enclosed Alternating-Current Arc Lamps.

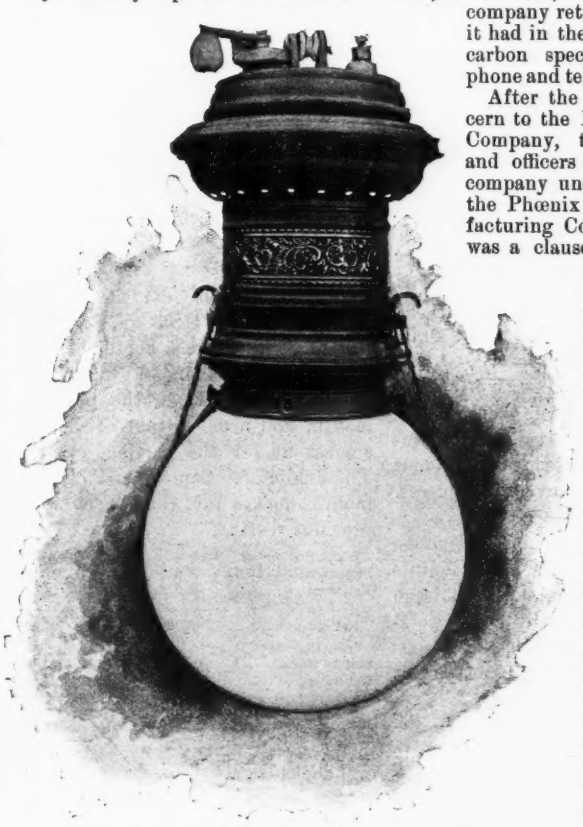
A careful consideration of the market for enclosed arc lamps seems to show that the demand is for an alternating, constant-current potential lamp that will operate on any frequency from 50 cycles to 133 cycles. When operating on any number of cycles between the above numbers, the lamps should be provided with an adjustment which would maintain the arc voltage at about 75 to 80, with a line potential from 95 to 125 volts. The lamp should be provided with a plain shell or cover of graceful design. The cover should be so constructed that the lamp will be adapted for indoor or outdoor service, and it should be so designed that either outer globe or reflector shade can be applied to the lamp without change in the cover or other parts.

With the above ideals in mind, the General Incandescent Arc Light Co., has brought out its new alternating-current lamp, illustrated herewith. It is stated that this lamp has received the hearty indorsement of engineers and central station experts, to whom it has been submitted. In designing this lamp, great care has been taken to produce a perfect contact between the upper carbon and the central tube. All users of arc lamps have experienced more or less trouble from sliding contacts attached to the upper carbon-holder, the purpose of these contacts being to carry the current from the source of supply to the movable upper carbon.

In the new lamp the current for the upper carbon is supplied through a flexible wire which is applied to the lamp in a manner heretofore unpracticed. This feature is said to obviate a large part of the trouble formerly experienced in arc lamps, especially in those constructed for alternating current. In designing the dash-pot a new mechanical idea has been evolved to prevent the sticking of this generally troublesome part of the mechanism.

The lamp is equipped with two solenoids and a U-shaped core. The skeleton for the solenoids is made of vulcabeston, moulded into the proper shape. This, while a rather expensive construction, is justified when it is found that the heating effect in the coils is cut down about 25 per cent. The wire used in the coils has a carrying capacity of 25 per cent over the maximum required by the lamp. The suspension of the solenoids is a new feature, and is said to prevent any vibration being transmitted to the lamp frame. A special device has been provided, the result of which is the confinement of all vibration of the U-shaped core within itself, thus preventing the mechanism from rattling—a great objection to alternating-current lamps.

Another important feature of the new lamp is the choke coil, which, being made in two sections, insures ease of repair in case of trouble in the hands of the ordinary user. These coils are machine wound and provided with suitable loops which allow a great range in adjustment, making the lamp suitable for a commercial circuit. Much care has been taken to produce a quick, simple and practical trimming device, by the use of which it is impossible for the inner globe to crack by its own expansion. To the outer globe is screwed a metal ring provided with two substantial spring catches. These catches hook into the rim of the outer cover, thus supporting the globe and making a dustproof and practically waterproof joint. When the lamp is to be trimmed it is only necessary to pull out these catches and lower the outer globe, which will then be supported by two chains. This leaves free access to the inner globe and to the trimming device. The carbons used are 9½ by ½ inch, cored or solid in the upper holder; in the lower holder 5¾ by ½ inch, either cored or solid. The cover of the lamp is supplied with large ventilating apertures. The length over all is 25 inches with outer globe and 24 inches with reflector shade. Life will vary from 75 to 80 hours, depending on the quality of the carbons. As with all its other manufactures, this company is prepared to furnish these lamps in any finish.



A NEW TYPE OF ALTERNATING-CURRENT ENCLOSED CONSTANT-POTENTIAL ARC LAMP.

Mr. Ira McCormack, general superintendent of the Brooklyn Rapid Transit Company, of Brooklyn, N.Y., has resigned that position to become vice-president and general manager of the Syracuse, N. Y., Rapid Transit Company.

Carbon Companies in Litigation.

The Phœnix Battery Manufacturing Company, of St. Louis, has been having some interesting legal experiences. It appears that, in January, 1899, the company being then known as the Phœnix Carbon Manufacturing Company, the National Carbon Company bought out its interests in the manufacture of electric light carbons and brushes. The price paid, the transaction having been completed in March, is variously stated at from $175,000 to $187,000. The Phœnix company retained an interest it had in the manufacture of carbon specialties and telephone and telegraph batteries.

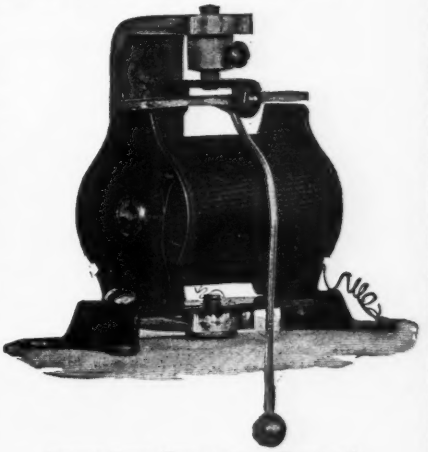
After the sale of the concern to the National Carbon Company, the stockholders and officers organized a new company under the name of the Phœnix Battery Manufacturing Company. There was a clause in the contract for the sale which provided that possession should not be given of the plant until after written notice had been given and six months had expired.

On September 20 the National company filed a replevin suit in the United States Circuit Court at St. Louis, and later the sheriff seized the plant. Col. S. G. Booker, the general superintendent of the company, claims that no notice had been given to any of the officers or stockholders of the company, and that hence there was no occasion for giving possession of the property. It develops, however, according to the statements made by Colonel Booker, that he had secured an option on all of the stock of the newly organized company, and that he expected to start a plant of his own as soon as the buildings could be erected. For the purpose he bought eight acres of land, and had the foundations of his buildings already laid. He declared that it was his purpose to build up a new business, and said that there was nothing in the obligations of himself or any one else who was a party to the sale of the old plant to prevent him from doing this.

On September 25 the Phœnix company gave a bond for $40,000 for the release of the plant from the sheriff, which was obtained, the case to come up for settlement in March, 1900. Meanwhile, the work on the new plant is being pushed forward.

A New Type of Single-Core Telephone "Ringer."

The illustration herewith shows a new type of single-core polarized or telephone "ringer" which possesses several points of interest and merit.



SINGLE-CORE TELEPHONE "RINGER."

It is built on the same principle of the familiar Watson double core ringer, and differs from it only in having one winding instead of two. The two heads or ends of the spool form the two cores and the single spool in this form does the same work performed by the double spool in the older type. It is claimed that, by virtue of the relationship of the core and windings to the permanent magnet, this is a more efficient type of apparatus than the older forms. It is made by the Williams Electric Company, Cleveland, Ohio. This concern has lately made some additions to its factory capacity, enabling it nearly to double its output and more promptly fill its orders.

The United States Government and Marconi's Wireless Telegraphy.

The Navy Department has ordered a board of four officers to inspect and report upon the availability of Marconi's system of wireless telegraphy, for signaling purposes aboard ship and between vessels and the shore.

The ELECTRICAL REVIEW understands that Mr. Marconi wants the government to pay him $1,000,000 for the unlimited use of his apparatus, or to pay $500 for each set of his instruments and $500 per year royalty on each set.

It is not believed, however, that the government will pay any such prices for Marconi's apparatus, and it is rumored that negotiations are in progress with another European inventor who has produced similar apparatus, which can be secured at a much more reasonable figure.

Lieut. J. B. Blish, U. S. N., has been ordered to the Bureau of Equipment at Washington in connection with experiments in wireless telegraphy.

Telephone News .....and Comment

Mr. Spaulding, of the Philadelphia Bell Telephone Company, visited New York city last week.

There are 112 towns in France outside of Paris which are provided with telephone exchanges.

In Japan the manufacture of telephones is being carried on both by the government and private concerns.

Hawaii is said to have more telephones in use in proportion to the population than any other locality in the world.

The people of Chippewa Falls, Wis., recently held a meeting and denounced the local Bell company for raising telephone rates.

The American Telephone and Telegraph proposes to embrace all the principal cities of Georgia in its long-distance system.

Telephone rates at the Paris Exposition will be $60 for the installation and service during the period of the exposition.

The Chester County, Pa., Telegraph and Telephone Company, which absorbed the Phœnixville company, has brought suit against the latter to recover $345.67.

A dispute is on between the druggists of Minneapolis, Minn., and the Northwest Telephone Exchange Company over the frivolous and flippant use of the telephone.

The Michigan Telephone Company has purchased ground in Detroit upon which to erect an exchange building. This will make the seventh in Detroit besides the relay station.

The automatic coin-controlled telephone is in considerable use in Berlin, and if the results of the experiments are satisfactory, this means of communication will be used all over Germany.

Because the state board of transportation has refused to force the Nebraska Telephone Company to reduce rates the citizens of Omaha are said to be arranging to organize an independent company.

The completion of the telephone line connecting the City of Mexico with the port of Nautla on the north and the cities of Cordoba and Zongolica on the south, has opened up all the most important coffee districts of the country.

The rural telephone service is said to be most advanced in northeastern Ohio, and particularly in Geauga County, which is strictly an agricultural county. Not only is there an office in every township, but hundreds of farmers have telephones in their homes.

The Chesapeake & Potomac Telephone Company is delivering its new call-book containing the list of subscribers in Baltimore, Md. All the telephones of the company have been grouped into six subordinate exchanges for quicker and more effective service.

The plant of the Farmers' Telephone Company, of Massillon, Ohio, has become the property of the United States Company, of which Henry A. Everett, of Cleveland, is president. The United States Company has purchased independent plants in several surrounding places.

The plans of the Illinois Telephone and Telegraph Company for conduits under the streets of the city of Chicago have been approved by the Department of Public Works. The officials of the company applied for a permit to build a conduit 4 feet by 7½ feet at a depth of 25 feet below the surface. The answer to the company will allow the company no way of constructing conduits which can be used for transportation purposes.

Mr. E. D. Trowbridge, superintendent of the long-distance telephone service of the Michigan Telephone Company, the Wisconsin Telephone Company and the Northwestern Telephone Exchange Company, with headquarters at Detroit, Milwaukee and Minneapolis, has been East in conference with Vice-President H. J. Pettengill, of the Erie system, relative to the adoption of the one-minute service on all the lines of the Erie system in Michigan, Wisconsin, Minnesota, North and South Dakota.

Several times during the past eight years companies have been incorporated in New York state proposing to establish new telephone systems. The latest of these is "The New Telephone Incorporation of the city of New York and the state of New York." The purposes of the new company as stated in the articles of incorporation, are principally to supply the city of New York and the state with a telephone service commencing first in the leading cities of the state, Buffalo, Rochester, Albany, Syracuse and Utica.

"Native Tact and Foreign Comment" is the title of a beautifully prepared pamphlet printed in colors and issued by the New York Telephone Company. It describes the system of rates of the company and gives some interesting figures of the growth of the telephone business in New York city, as well as a number of comments from distinguished foreigners who have had the opportunity of investigating the company's service.

The instrument exhibit of the American Bell Telephone Company for the month ended September 20, shows shipments of 56,698 instruments, against 42,140 the previous month, and a net output of 36,625 against 26,751 the previous month. The exhibit for September and nine months makes this comparison with previous years:

Month September.	1898–99.	1897–98.	1896–97.
Shipments	56,698	31,977	19,198
Returned	20,073	12,931	7,105
Net output	36,625	19,046	12,093
From December 20.			
Shipments	488,737	244,724	162,743
Returned	145,227	104,259	69,106
Net output	343,510	136,465	93,637
Instruments in use	1,467,996	1,055,586	866,264

The contract has been awarded for the construction of the main telephone exchange for the Pittsburgh & Allegheny Telephone Company, at Pittsburgh, Pa. Another contract has been let to the Standard Underground Cable Company for 95,000 feet of heavy cable for underground conduits. The company has already awarded contracts aggregating $600,000. It is the purpose of the company to have the lines in operation by early Spring. The exchange, a three-story brick building, will have a frontage of 45 feet on Seventh avenue and 100 feet on Fountain. Eighty girl operators will be employed.

Representatives of independent telephone companies met in Chicago recently and consolidated themselves into the Independent Telephone Association of the United States. The new State Telephone Company, of Indiana, the State Telephone Company, of Michigan, the United States Telephone Company, of Ohio, the organizations of three states, respectively, together with the unorganized independent telephone companies of Illinois and Pennsylvania, perfected their consolidation and arranged details. At a later meeting in Chicago directors and officers will be chosen. The Illinois Telephone and Telegraph Company, which owns a telephone franchise in the city of Chicago, will probably enter the consolidation.

President Morris F. Tyler, of the Southern New England Telephone Company, is at work on the plans of a new branch of telephone work, which will undoubtedly be a great convenience to the people of the state. The president is now considering plans for establishing experimentally in one of the large exchanges of the company an information bureau. Briefly stated, it is the idea to have an attendant in one of the exchanges, either in New Haven or Hartford, whose business it will be to be informed concerning matters of current news concerning this state. News matters, such as fires, baseball games, boat races, accidents of all kinds, and, in fact, all things that people want information about, will be reported to the subscribers of the Southern New England Telephone Company, free of charge.

Figures for September for the three great telephone companies of the West, the Central Union, the Pacific Coast and the Erie, show a steady and remarkable gain in business. All three companies report an aggregate gain of 7,005 subscribers for the month, this being one of the best showings ever made. Erie leads with an increase of 3,689, a fact which seems to indicate that the 100,000 mark, the point aimed at for this year, may be reached. The showing in detail is as follows:

Month of September:

	Gain.	Total connected.
Central Union	1,533	56,625
Pacific Coast	1,783	58,486
Erie system	3,680	95,090
Total	7,005	210,201

Gain since January 1:

Central Union		11,609
Pacific Coast		13,501
Erie system	3,689	95,090
Total		57,457

These figures show a growth in the telephone business of the western and southwestern country that is unparalleled by any records in the history of the service.

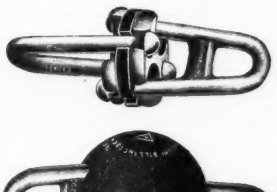
New Electric Railroad Company in Ohio.

Further information has been received regarding the extensive contract recently awarded to Westinghouse, Church, Kerr & Company for equipping an electric railroad between Toledo, Fremont and Norwalk, Ohio. The line will be over sixty miles in length, running through Woodville, Fremont, Clyde, Bellevue and Monroeville.

When this road was first promoted the firm named were appointed the engineers and architects, and they are designing the system throughout, including the electrical equipment, the central power station, the substations for feeding the lines, the overhead construction, car shops, car barns and the general equipment of the road.

The most advanced ideas of electrical construction will be embodied in this road. Three phase alternating current will be employed instead of direct current, which is usual in suburban traction. This system will enable the whole line to be supplied from one central power station. At Fremont the power station will be erected, and the current transmitted at a high voltage in both directions. The power station will be furnished with five 300-horse-power Babcock & Wilcox boilers, equipped with Roney mechanical stokers and coal and ash-handling machinery. Two 400-horse-power central elevated jet condensers will be provided. Hot feed-water and a good draft will be furnished by a complete mechanical draft and economizer system, while the feed-water will be treated before being pumped into the boilers to remove the scale-forming properties. The exhaust steam from the auxiliary engines will be used for heating the feed-water on its way to the economizer, an economizer being applied to heat the feed-water up to a very high temperature. Four Westinghouse Columbian-type engines will be directly connected to four 500-kilowatt low-speed engine-type three-phase generators, each engine, with its generator, being mounted upon a massive bed-plate, insuring accuracy and permanency of alignment. Two 9 x 15 x 9 single-acting compound engines will be directly connected to two 30 kilowatt exciter generators.

In addition to the Fremont central power station, six substations will be built about equi-distant from each other along the line of the railroad, while a seventh substation will be provided within the power house at Fremont. The current generated at the central power station will be raised by transformers and transmitted at a high voltage—about 15,000 volts—to the substations, and there lowered by step-down transformers and changed by rotary converters from alternating to direct current for feeding the trolley lines. Each substation will be equipped with three step-down transformers and two rotary converters, together with a switchboard and con-



STREET RAILWAY STRAIN INSULATOR.

trolling apparatus, and will be connected by feeders with the trolley line and direct-current feeders. The road-bed will be very substantially constructed, as it is intended to run the cars at a speed upward of forty miles an hour.

By adopting the alternating current, it is possible to supply the entire sixty miles of the Toledo, Fremont & Norwich Electric Railroad from one central power station, and to reach out to supply feeders in all directions or extend from the termini. The saving in copper wire alone by using a high-tension transmission is estimated at considerably more than $100,000. The facilities offered by the use of alternating current will have an important influence in fostering long-distance railroad systems.

The power plant at Fremont is designed to admit of ready extension without destroying the symmetry of its design. The building will have a fireproof roof, and a traveling crane will span the engine room.

The substations will be arranged so that they will be operated with very little extra attention, being combined with passenger and freight stations at most points.

A Street Railway Strain Insulator.

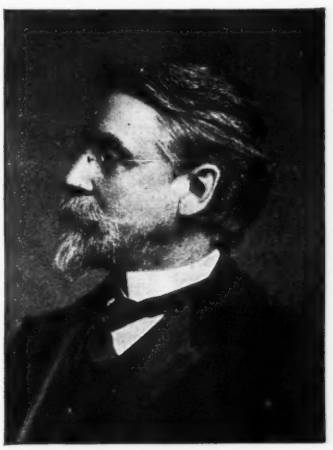
The well known manufacturers of overhead street railway material, the Billings & Spencer Company, of Hartford, Ct., are placing on the market a drop-forged, link-ball strain insulator, shown in the illustrations herewith, from which its construction may be readily understood. It is made with Tobin bronze links and disks or with galvanized steel links and disks.

DR. WILLIAM P. WILSON.

THE DIRECTOR-GENERAL OF THE NATIONAL EXPORT EXPOSITION.

Dr. William P. Wilson, director of the Philadelphia Commercial Museum and director-general of the National Export Exposition, which is now open at Philadelphia, is a man of unusual intelligence and of marked executive ability. In 1893 he conceived the idea of founding a commercial museum, using as a nucleus the raw products exhibited by different nations at the Chicago World's Fair. He secured authority from the city of Philadelphia, and succeeded in having donated to the proposed museum the large collection of natural products exhibited by nearly every country, especially the Spanish American countries. Since that time his plans for the successful organization of the museum have been carried out, and the result has been very helpful to the commercial interest of this country. The National Export Exposition, of which he is the director-general, is under the auspices of the Commercial Museum and Franklin Institute.

Dr. Wilson was educated at the Agricultural College of Michigan and



DR WILLIAM P WILSON.

at Harvard University, where he afterwards was instructor in botany. He also spent several years in the universities of Germany and Italy, receiving the degree of Doctor of Natural Sciences from the University of Tübingen. For several years he was professor of botany and director of the School of Biology in the University of Pennsylvania.

Since the organization of the Commercial Museum he has visited Europe several times, traveling through England, France, Germany, Switzerland, Italy and other countries for the purpose of studying the economic and trade relations. In 1897 he made a long trip through Mexico to secure accurate information of the resources and trade conditions of that country for use of the museum, and in 1898 he visited Venezuela for the same purpose. Dr. Wilson is a man who is always active, and who possesses the faculty of imparting his earnestness to those around him.

The New Pegasus.

[*From the Automobile Magazine*]

No more the bard, leaf-wreathed and solemn,
In syllables of airy gold,
Sings, seated on the spinal column,
Of Pegasus the steed of old—
Because to-day old Pegasus
Has been unhorsed—he's now a 'bus!

No more o'er dizzy heights he'll hurtle,
As he has done since time began;
He'll soon be hymned as choice mock turtle—
A pearl imprisoned in a can.
The bard upon a new horse sings,
That goes on wheels and not on wings.

The bard whose rosy fancy rises
Into the heavens brightly stirred,
Who art for art's sake idolizes,
Yet writes his sonnets by the yard,
Sings: "Money makes in weal and woe,
The horseless carriage horseless go."

In youth we learned with studious rapture
About the ancient Siege of Troy,
And how that great historic capture,
Which glads the heart of man and boy,
Was made by men hid head and heels
Within a horse whose hoofs were wheels.

Then let the horseless carriage gather
The laurel wreath on any course!
Or call it simply, if you'd rather—
'Tis quite correct—the horseless horse,
That glides along without a break,
And, though he eats not, takes the cake.

So clear the track and let this peerless
Equine outfly the whirling wind,
On noiseless wings, in spirit fearless.
He'll leave all other shapes behind!
For Science we must say, perforce,
Has put the cart before the horse.

R. K. MUNKITTRICK.

LITERARY.

President Hadley, of Yale College, one of the best authorities on the subject in the country, and a man whose opinions have the value of deliberate observation of actual conditions, has written an article on "The Formation and Control of Trusts" for the November *Scribner's*. Of their future he says: "The question of state ownership of industrial enterprises, instead of becoming an acute national issue, as so many now expect, will tend rather to become relatively unimportant, and may not improbably be removed altogether from the field of party politics."

Trolley wire thieves made a rich haul along the line of the Chestnut Hill and Norristown lines, near Plymouth Meeting, Pa., one night recently, when they cut a double stretch of feed wire from the poles and carted it away. Wagon tracks were discovered in the morning leading towards Philadelphia. Traffic was delayed several hours. It is stated that the thieves left the poles and tracks behind.

ELECTRIC RAILWAY NOTES.

It is proposed to extend the electric road which runs from Galion to Bucyrus, Ohio, to Upper Sandusky, *via* Nevada.

The Middletown–Goshen (N. Y.) Electric Railroad was sold recently at the Russel House by William B. Royce, receiver, for one dollar.

The Oakland (California) Transit Company has been offered a bonus of $1,000 by the residents of Allendale to extend its line of street railway to that picturesque suburb.

The Municipal Council, of Berlin, Germany, has passed a resolution that in future all new street car lines shall remain exclusively under municipal ownership and management.

The gross earnings of the Metropolitan Street Railway, of New York city, for its past fiscal year amounted to $13,158.631. The operating expenses represent between 48 and 49 per cent of this amount.

The securing of the right of way for the extension of the Toledo & Maumee Valley Electric Railway to Waterville, Ohio, has been begun, and the line will be constructed as rapidly as possible.

Under the present system of transfers on the surface street car lines on Manhattan Island it would be possible for a man to keep riding during the remainder of his life on the payment of one five-cent fare.

The construction of the electric road from Erie to Cambridge Springs, Ohio, has started a boom among the farmers along the line, their property having advanced in value from 25 to 50 per cent.

The work of paralleling the Michigan Central with continuous electric lines from Detroit to Kalamazoo, Mich., a distance of 144 miles, is apparently being pushed. The Kalamazoo–Battle Creek line is under process of construction now.

In staking out the tracks of the Northampton & Amherst (Mass.) Electric Railway it was recently discovered that some of the dwellers on the thoroughfare have possession of territory included in the highway limits. In some cases it amounts to about six feet.

The Wilmington Traction Company, of Wilmington, Del., consisting of Messrs. Edmund Mitchell, Jr., collector of delinquent city taxes; Harry H. Billany, assistant postmaster; William H. Heald, attorney; C. Leighton Mahoney and Charles Heritage, has applied for a franchise in that city.

The contract for the Bellows Falls & Saxton River, Vt., Electric Road has been awarded to C. W. Blakslee & Sons, of New Haven. Work on the construction of the roadbed is to begin at once. The Bellows Falls terminus of the road will be at the Union Station beside the Boston & Maine Railroad tracks.

The street railways now operated in the system comprising the Massachusetts electric companies report their gross earnings for the fiscal year ending September 30 as having aggregated $4,479,122, against $4,111,132 for the previous year—a gain of $367,990. The accounts are not yet completed, so as to show the net earnings.

Cable advices having been received from Buenos Ayres that the municipal authorities of that city have decided to remove the clause which insisted on the free lighting of streets traversed by trolley lines, it is stated in London that such a decision will mean the practical wiping out of the horse roads, by the substitution of electric means of locomotion.

The Dayton, Springfield & Urbana, Ohio, Traction Company will build a place of amusement midway between Dayton and Springfield. A chute and theater building will be erected. The power house will be erected at Medway at a cost of $35,000. Robert Gotwald is the architect. Colonel Fred Colburn and J. S. Harshman are interested in the enterprise.

The Kashmir Railway, to be constructed over 186 miles in the most northerly and most mountainous parts of India, will be operated by electricity, water-power being used to generate the current. The use of electricity allows a much lighter engine to be used for drawing the same load, and permits of grades which a steam engine could not climb, except with the assistance of a rack and pinion.

The Fort Wayne Consolidated Street Railway lines, Fort Wayne, Ind., and Robison Park were sold at receiver's sale a few days ago for $1,092,000 to Gen. George A. Garretson, the Cleveland banker, who is at the head of a syndicate holding bonds and claims against the company to the amount of $3,000,000. General Garretson was the only bidder, and his offer was in excess of the appraised value, $564,000.

A Boston syndicate of capitalists has secured options on six of the street railway lines in Seattle, Wash., and has closed the deal for the purchase of four. The lines are the Madison Street Cable Railway Company, the Union Trunk Line, the West Street & North End Electric Railway and the Seattle Traction Company. Improvement work will be commenced at once. The purchase price aggregates $4,000,000.

By order of the municipality of St. Petersburg, Russia, electric tramways are to replace the existing methods of street service on the principal streets of that capital. A committee appointed has decided that the overhead system should be adopted, using ornamental posts suitable for supporting arc lamps. The rolling stock is to consist of 60 cars capable of carrying 52 passengers each, and each fitted with two motors. The cars are to be lighted by electricity.

The $1,500,000 mortgage of the Tacoma (Wash.) Railways and Power Company to the Old Colony Trust Company, of Boston, decided upon last April, was filed a few days ago. There were $750 worth of revenue stamps on the instrument, which was printed in pamphlet form. By its provisions the company will be enabled to issue 1,500 bonds of $1,000 each, bearing five per cent interest, payable semi-annually, and the life of the bonds is to be thirty years.

Electric cars will soon be running from Boston to Worcester, Mass. The distance is 50 miles, and the fare will be 50 cents, or one cent a mile. The cars will be run on half-hour schedule at first, with 15 minute turnouts on the single track between Framingham and Worcester. The cars will be the largest ever built for street railways. The first order is for 25, each 40 feet long, seating capacity, 50. The line will pass through nine good-sized and prosperous towns.

Mexico City is rapidly becoming modernized, and the improvements that have taken place in the last few years are really remarkable. It is now one of the best lighted cities in the world, and hopes soon to be rid of the antiquated mule cars that have so long retarded the development of the suburbs. The rails for the new trolley lines were laid some time ago, but operations were delayed owing to the non-arrival of some of the electric machinery. It is now on the ground, and the roads will be open for business very shortly.

A cash offer of $13,000,000 is said to have been made for the Northwestern Elevated, one of the so-called Yerkes properties, now in course of construction on the north side of Chicago. The offer was made by the Whitney–Widener–Elkins syndicate. In case the deal is concluded, the purchasers, who are the same persons who now control the Union Traction Company, intend to pay off the bonds and complete the road. The offer is equal to par for the Northwestern Elevated preferred stock, and $60 a share for the common stock.

There are at present ten horse tramway companies in the city of Buenos Ayres. It is but two years ago that the electric street railway was introduced in that part of the world, and it was a success from the start. The first line was but experimental, some ⅝ of a mile in length. To-day there are two distinct companies, in different parts of the city, operating some 40 miles of track, and constructing more as fast as they can get the necessary material from the United States, for only American equipment is used. Those two concerns are controlled by English capital.

The Bureau of Building Inspection, of Philadelphia, is in receipt of plans for a storage battery plant to be erected at Fifth and Lombard streets for the Union Traction Company. The structure will be two-story, 42 by 50, brick, terra-cotta, and will contain a battery, the total capacity of which will be equivalent to 250 horse-power. The company contemplates the erection of a series of such plants throughout the city, by which it is hoped to relieve the strain upon the general power plants during the heavy traffic. Work of construction will commence as soon as the plans can be approved.

According to advices from Knoxville, Tenn., negotiations have been opened with the owners of the Chattanooga Street Railway properties for their purchase by the Baltimore syndicate, which has secured control of the street railway and the electric light properties of Nashville and Knoxville. The Chattanooga deal, it is understood, is to include the Chattanooga Electric Railway, the Rapid Transit Company, the Signal Mountain Electric Railway and the Chattanooga Electric Light and Power Company. It is possible that the incline railways up Lookout mountain may also be included. The syndicate is also said to want the street railroad properties in Atlanta and other southern cities.

IN CHICAGO.

(Concluded from page 247.)

In the afternoon, coming over the New York Central and Lake Shore railroads, including, among others, H. H. Vreeland, J. P. McQuaide, Luther Stieringer, Frank MacGovern, Frank J. Sprague, C. A. Benton, M. R. Cockey, C. B. Fairchild, E. C. Long, James H. McGraw, E. E. Higgins, E. H. Mullin and W. Beran, of New York city; J. H. Stedman, Rochester; Albert Young, Buffalo; W. B. Potter, Schenectady; E. F. Peixas, Amsterdam; T. C. Frenyear, Buffalo.

Another party of eastern delegates and visitors came in over the Pennsylvania Railroad, arriving Monday afternoon. Among these were R. W. Beach, of the General Electric Company; Major H. C. Evans, of the Lorain Steel Company; E. J. Lawless, of the American Car Company; J. E. Mees, Herbert Luscomb, H. Trainor and A. H. Berry, of the H. W. Johns Manufacturing Company; Elmer P. Morris, of the Morris Electric Company; B. M. Barr, of the Stirling Company, and S. H. Harrington, of the Union Railway Company, all of New York, besides a number of Philadelphia, Washington and Pittsburgh gentlemen.

The J. G. Brill Company have the suite known as "The Club" in the auditorium Annex, their exhibit being models only. The company is represented by a half dozen ubiquitous gentlemen, but Mr. John A. Brill, who seldom misses a convention, is absent in Europe, called there by important business of the company. E. Peckham, J. H. Carson and W. L. Candee are other notable absentees.

The General Electric Company has in operation in its exhibit various types of motors, and also shows splendid specimens of generators, controllers and many modern features in electrical machinery from its shops.

The Westinghouse Electric and Manufacturing Company shows several immense generators, completed switchboards and complete lines of station apparatus.

Both the General Electric Company and the Westinghouse Company are represented by a large staff of well known electrical men.

The Morris Electric Company, of New York, occupies a large and particularly attractive space, exhibiting Keystone instruments, Morris railbonds and railway specialties, with the energetic Elmer P. Morris in charge, with several associates and assistants.

Among other large exhibitors are the H. W. Johns Manufacturing Company, car heaters; Garton-Daniels Electric Company; Adams & Westlake Company; McGuire Manufacturing Company; New Haven Car Register Company; American Steel and Wire Company; Lorain Steel Company; Standard Paint Company; Creaghead Engineering Company.

The Central Electric Company, of Chicago, is making a very fine exhibit of railway supplies in general and Okonite wire in particular. This company has extended a cordial invitation to visitors to make their headquarters with it.

The official headquarters of the American Street Railway Association are at the Auditorium Annex. Quite a number of visitors, however, are registering at the Auditorium "proper," no doubt attracted by the last word of the title, where Colonel Ed Kennedy is providing the best of accommodations.

I append below a review of the first day's proceedings.

TUESDAY'S PROCEEDINGS.

The morning session was occupied largely with routine business. The president, Mr. C. S. Sergeant, opened the morning session with appropriate remarks, and after the ground was cleared by the disposal of the usual routine of the opening session, Mr. Charles T. Yerkes, president of the Chicago Consolidated Traction and Union Elevated Railroad Companies, of Chicago, read his paper, which was the principal feature of the day's session, and was an authoritative presentation of the status of street railway investments by one of the most experienced investors in these properties, and was received with the attention that its importance merited.

The convention was not called to order until after eleven o'clock. About 700 representatives have registered, and a conservative estimate places the attendance at fully 1,000. City Prosecutor Howard S. Taylor welcomed, in the name of Mayor Harrison, the delegates to Chicago, and Commissioner McGann performed a similar duty at the accountant's meeting. President Sergeant in his annual address said in part:

"The tendency toward consolidation of small or competing roads into larger homogeneous systems has been manifested in all directions. With the introduction of electric motive power the old-time horse railway company operating a few miles of track on two or three city streets has disappeared, and its larger successor has found necessary such changes in administration, such extensions of its system and service, that the advantages of combination with rivals have become more and more manifest. All this means changed conditions with new responsibility, and emphasizes the need of consolidation. The advantages of this larger growth are many, and perhaps not the least is a growing respect for the value and importance of the street railway industry. Another of the notable events of the year has been the failure of a striking attempt at municipal ownership, with which we are all familiar. It is greatly to be regretted that the year has been signalized by several very serious strikes and attempted boycotts. The paralysis of the transportation of a large city is a grave public calamity, to be prevented by all reasonable means in the power of the officers and men of the transportation companies and by the municipal authorities."

The paper read by Charles T. Yerkes received animated discussion by Mr. H. H. Vreeland, of New York, and others. Mr. Yerkes said in part: "The subject you have given me for consideration, viz., 'Investments in Street Railways; How They Can Be Made Secure and Remunerative,' is one in which I take great interest, and for a very good reason—about all the investments I have are in street railway securities. The most important matter in regard to the security of street railway securities is the length of charter under which they are operating. If a company has a charter with but a few years to run, the improvements will be of a cheap character commensurate with the length of that charter. Why should not the charters of street railways be equal to those of steam railways. The cost of the steam railway is not nearly equal to the cost per mile of a street railway, even counting all the appurtenances that go with each."

Mr. Yerkes then went on to show that electric plants should receive a charter for 200 years, and city ordinances to correspond.

This evening a reception was given to the delegates and their families by the local reception committee in the parlors of the Auditorium Hotel.

To-morrow (Wednesday) the programme includes a trip to the famous drainage canal. On Thursday the delegates will go in coaches for a ride through Jackson Park, and in the afternoon they will visit the stockyards, the pride of Chicago.

Friday, the last day of the meeting, will be given wholly to meeting supply men and examining exhibits.

The approaching election of officers is creating the usual comment and attracting even more than usual interest on the part of the delegates. Several gentlemen have been mentioned for the presidency, and, at this time, the prevailing impression is that a western man will be selected for this office, though the name of Mr. H. H. Vreeland, president of the Metropolitan Street Railway, of New York city, has also been suggested and meets with much favor. GODDARD.

Pennsylvania Street Railway Association's Annual Meeting.

The eighth annual meeting of the Pennsylvania Street Railway Association opened at the Stevens House, in Lancaster, Pa., on October 11. Mayor Schissler, of Lancaster, made an address of welcome, which was responded to by President Frank Silliman, Jr., of the association. Papers were read by Mr. W. P. McKenzie, of Harrisburg, on "Electric Railway Engines of To-day;" Mr. William H. Heulings, Jr., of Philadelphia, on "Track Construction;" President Frank Silliman, Jr., and others.

On the second day's session the following officers were elected: President, William B. Given, Columbia; first vice-president, E. C. Felton, Harrisburg; second vice-president, E. H. Davis, Williamsport; secretary, S. P. Light, Lebanon; treasurer, W. H. Lanius, York. Executive committee, William B. Given, Frank Silliman, Jr., Scranton; John A. Rigg, Reading; W. H. Lanius, S. P. Light and E. C. Felton.

The next meeting of the association will be held in Pittsburgh in September, 1900.

The Automobile Club of America Organized.

A number of gentlemen interested in automobilism met on Monday evening, October 16, at the Waldorf-Astoria hotel in New York, and perfected the organization of an automobile club having the above title. Permanent officers were elected, as follows: General Avery D. Andrews, president; George F. Chamberlain, first vice-president; V. Everit Macy, treasurer; Homer W. Hedge, secretary.

The purpose of the club will be the general advancement of automobile interests in the United States. The ELECTRICAL REVIEW congratulates the club upon the choice of General Andrews as its first president; a more admirable selection could not have been made.

Chicago Edison Company.

The plan for reorganization of the Chicago Edison Company has been completed. The new company will have a capital stock of $25,000,000 and a bond issue of $25,000,000 payable in gold, running for a period of 50 years, with the privilege of retirement at an earlier date and bearing four per cent interest. Wm. C. Whitney, A. N. Brady and M. J. Maloney, of New York, and P. A. B. Widener and W. L. Elkins, of Philadelphia, will, it is said, practically control the new organization.

ADVANCE INFORMATION

New Telephone and Telegraph Companies.

MONTICELLO, ILL. — The Platt County Telephone Company has been incorporated; capital stock, $5,000; incorporators, William F. Lodge, William E. Lodge, C. Snyder.

RAWLINS, WYO.—A contract has been let for a new telephone line between Battle and Rawlins.

BOISE, IDA. — Articles of incorporation of the Idaho Independent Telephone Company have been filed in the office of County Recorder Lamoreau. The principal place of business is Boise. The capital stock, $100,000. The incorporators are H. E. Neal, E. H. Beggs, J. S. D. Manville, George D. Ellis, A. J. Glorieux, C. F. Neal, A. D. Robb, Walter Schroff, H. W. Clement.

KERSHAW, S. C. – A telephone line is being built from this place to Camden, and from DeKall Station to Cantey Hill.

QUARRYVILLE, N. Y.—Arrangements have been completed by the Hudson River Telephone Company to extend its line to this place.

SHELBYVILLE, KY.—An independent telephone company has been granted a franchise by the Board of Council, and will proceed at once to install a plant at this place. The promoter of the enterprise is Maj. J. J. Downing, of Cincinnati, who has recently established plants in a number of Kentucky towns. It is his intention to cover the state with his system as soon as possible.

HELENA, MONT.—Superintendent Sommers, of the Rocky Mountain Bell Telephone Company, announces the completion of the line connecting the Montana and the Utah systems. About 150 miles of wire have been strung between Dillon and Idaho Falls during the past four and a half months, connecting the two systems. The line is double wired and very complete. It will be available to the public in a few days.

BIG SPRINGS, TEX. — The contractors have completed the long-distance telephone line to this city, connecting Big Springs with Stanton, Midland and Odessa, making a line 60 miles long.

BASIN CITY, WYO.—Work on the long-distance telephone line connecting this place with Red Lodge, Mont., has been commenced. The contract calls for the completion of the line by December 15 next. The total length of the line is 165 miles.

COLUMBIA, PA.—The Columbia Telephone Company is extending its system from Elizabethtown to Bellaire, and from Mt. Joy to Landisville.

BOSTON, MASS.—The American Telephone and Telegraph Company has completed its lines into Little Rock, where connection is made with the wires of the Southwestern Telegraph and Telephone Company (Erie system).

WHATCOM, WASH. — The Sunset Telephone Company is arranging to put in a line from here to Lynden. Enough subscribers have been obtained to assure the investment.

COLORADO, TEX.—The telephone line from this point to Cuthbert, sixteen miles in the country, has been completed.

BOULDER, COLO. — Arrangements have been made to extend the line of the Colorado Telephone Company to Jamestown, sixteen miles northwest of here, in the immediate future.

PLEASANT POINT, PA.—Progress is being made towards securing the automatic telephone line to this place.

New Electric Railways.

ALBANY, N. Y.—The State Board of Railroad Commissioners has granted the application of the Nassau Belt Line Traction Company for permission to construct an electric road from Mineola, through Hempstead, to Long Beach, a distance of thirty miles. The company's capital is $300,000.

HUNTINGTON, W. VA.—An Eastern syndicate has purchased the electric railways of Ironton, Ohio; Catlettsburg and Ashland, Ky.; Central City and Huntington, W. Va.

MILWAUKEE, WIS.—The project to build an electric line to Lake Geneva by the way of Hales Corners and Muskego Lake, following the old right of way of the Janesville road, has been revived. Attorneys are now engaged in securing the right of way, one-third of which has been secured. Eastern capitalists will furnish the money with which to build and equip the line.

COLUMBUS, OHIO—The three street railway lines of this city—the Columbus, the Columbus Central and the Cross-town—have been consolidated under one management, with Robert E. Sheldon as president and P. V. Burrington as secretary. E. K. Stewart, general manager of the Columbus, will be made general manager of the consolidation.

NORWALK, OHIO—M. Bullock, of New York, has purchased for an eastern syndicate the People's Electric Railway, of Sandusky, and the Sandusky, Milan and Norwalk Electric Railway for $140,000 cash.

DUNKIRK, N. Y.—The Dunkirk & Hickoryhurst Electric Railroad, to operate through the city of Dunkirk to Point Gratiot, Chautauqua County, a distance of seven miles, has been incorporated with a capital stock of $50,000.

WARREN, OHIO - President E. E. Rawdon, of the Burton, Jefferson & Andover Electric Railway Company, has filed with the Trumbull County commissioners application for a franchise for lines from Colebrook to Warren, 25 miles, and Kinsman to Cortland, 15 miles.

FREEPORT, L. I.—The Nassau Belt Line Company, which is composed almost entirely of local capitalists, has been given permission by the state railroad commissioners to build a trolley line from Mineola to Freeport and Long Beach, by way of Rockville Center and East Rockaway. The commissioners gave a similar franchise about two weeks ago to the Mineola, Hempstead and Freeport Traction Company.

KAUKAUNA, WIS.—The East Shore Electric Railway and Light Company has been incorporated. The offices of the company will be located in Kaukauna. The capital stock is $25,000. D. J Brothers, H. J. Mulholland and William Breier, of this city, and Charles Smith, incorporators.

WILMINGTON, PA.—The contract for the erection of the trolley line from this place to Kennett Square and Unionville, has been awarded to William H. Quigg, of Philadelphia.

ST. LOUIS, MO.—A franchise has been granted to the Wellston, Creve Coeur Lake & St. Charles Railroad Company to construct a branch line to its electric railroad on the St. Charles rock road, from a point between the Lucas and Hunt road and Ferguson avenue, in a northwesterly direction to the corporate limits of the city of Ferguson, four miles.

New Incorporations.

KANSAS CITY, MO.—The Street Railway Supply Company has been incorporated. The company has a capital stock of $10,000. The incorporators are William D. C. Smith, William B. Henderson and A. F. Brodie, all of Kansas City, Mo., and Edwin Fowler, of Kansas City, Kas.

ST. LOUIS, MO.—The Globe Electric Company, of St. Louis, has been incorporated; capital stock, $100,000; incorporators, Gustavus Heibel, George Anson Clark, Gustave Miller and Samuel D. Winter.

BALTIMORE, MD.—The Delaware Electric Company has been incorporated; capital, $200,000.

NEW YORK, N. Y.—The American Motor Mobile Company has been incorporated; capital, $100,000.

NEW HAVEN, CT.—The Vermont Construction Company has been incorporated to construct and build street railways; capital, $25,000; incorporators, C. W. Blakeslee, D. A. Blakeslee, D. W. Blakeslee, S. C. Morehouse, all of New Haven.

NEW YORK, N. Y.—The J. H. Bunnell & Company has been incorporated to deal in telegraph and other electrical instruments; capital, $30,000; directors, Charles McLaughlin, Henry L. Shippy, William E. McLaughlin, John J. Greagan, William H. Bull, New York city.

Increase of Capital.

FRANKFORT, KY.—The West Kentucky Telephone Company, of Mayfield, has increased its capital stock from $15,000 to $25,000.

KANSAS CITY, MO.—The Ardmore Electric Company has increased its capital from $10,000 to $25,000.

KANSAS CITY, MO.—The Chickasaw Telephone Company has increased its capital from $5,000 to $50,000.

The Western Electric Company's New Building in Chicago.

With the completion of a new building the Western Electric Company will have, in its Chicago plant, over 1,000,000 square feet of floor space. The latest building, fronting on Jefferson, Congress and Clinton streets, is of brick and steel, with sheet-iron and tile partitions, with the exception of the offices, which occupy the entire eighth floor; all windows are of wire glass, and, in the portion on Clinton street, most recently erected, the window frames are of steel. Five passenger elevators and two large freight elevators in the building convey the employés and material. Stairways, enclosed by brick walls separated from the floors by iron doors and constructed of slate and steel, form safe and easy exits for the employés; in addition, ample fire escapes are provided.

A complete sprinkling system is installed through the buildings. Artesian well water is pumped through a refrigerator and supplied for drinking purposes on all floors. Rest rooms are supplied for the women employés and a restaurant is conducted by the girls, the company supplying the space, the light and fuel. A rigid and competent janitor service keeps the building clean and free from refuse material which would cause danger from fire. The employés in the shops are provided with individual steel lockers, and the toilet and sanitary arrangements are of the best.

A large power plant of an ultimate capacity of 3,500 horse-power supplies the buildings with light and heat, and furnishes power to the factory, and contains pressure pumps for fire purposes. A fire-alarm and watchman system enables a close watch to be kept at all times.

A movement is on foot among the independent telephone companies of Kansas to join hands and build a network of toll lines in the state. Several companies operating in eastern Kansas towns have combined and are building a line from Fort Scott to Atchison, touching all of the big towns along the border except Kansas City, Kas. As soon as this line is completed extensions will be made to central Kansas towns.

Kindred.... ...Interests

The Central Electric Company, Chicago, is carrying an ample stock of fire and weatherproof wires to conform with recent underwriters' specifications.

The Bossert Electric Construction Company, of Utica, N. Y., is erecting a new addition to its factory, in which a new branch of manufacture will be introduced.

The beautiful electric light fixtures in the Sacred Heart Church, Newton Centre, Mass., were manufactured by Messrs. McKenney & Waterbury, Franklin street, Boston.

The Bullock Electric Manufacturing Company, Cincinnati, Ohio, has issued bulletin No. 0735, descriptive of its direct-current multipolar motors, which are readily adapted to driving machine tools of any sort.

The Western Electric Company has distributed among the trade their Petite alternating-current arc lamp catalogue. Any of the readers of the ELECTRICAL REVIEW who have not received this catalogue will do well to write for a copy.

The Christensen Engineering Company, of Milwaukee, Wis., has issued a revised catalogue of its electric air-brake apparatus. It is known as catalogue B, is a valuable contribution to the subject it covers, and may be had for the asking.

The Maintenance Company, 220 Broadway, New York city, has issued an artistically attractive leaflet, entitled "Thoughts to be Maintained," descriptive of its system of maintaining electrical machinery under a liberal yearly contract. The leaflet is well worth perusal by owners and users of electrical apparatus.

The Electric Appliance Company, Chicago, have issued a pamphlet giving description and prices on the Gutmann recording wattmeter, for which they are Western selling agents. The Electric Appliance Company have a reputation of pushing the sale of new specialties only when they are assured that they are electrically and mechanically perfect.

Buying and selling strictly modern material of proved worth characterizes the electrical supply management of the Central Electric Company, Chicago. Closely following this business rule has caused this firm to give much prominence to the genuine Edison sockets of the latest types and its faith is shown by the large and maintained stock of these wiring features.

The New Era Iron Works, of Dayton, Ohio, manufacturers of the "New Era" gas and gasoline engines, have recently purchased a new plant, which they are remodeling and equipping with all the latest improved machinery. The demand for the "New Era" has been such as to compel this action, and by January 1 their capacity will be doubled, and they will have one of the finest gas engine factories in the United States.

The Sterling Electric Company, of Chicago, reports having just closed a contract with the Home Telephone Company, of Crawfordsville, Ind., for an entire new exchange equipment, consisting of a 1,000-number switchboard, with 600 numbers mounted; also, cross-connecting and distributing boards and office terminals and protectors. The Bell style apparatus, manufactured by the Sterling company, seems to be constantly growing in popularity.

The Western Electric Company has installed three 75-kilowatt generators of the direct-connected type, in the large dry-goods house of William Donaldson & Company, of Minneapolis, Minn. The dynamo and engine room is easy of access, and it is the intention that customers shall be invited to visit the room in which the machinery is installed. William Donaldson & Company consider that a first-class electric light plant well installed and kept in good order will always be an interesting sight to many of their customers, and they extend a general invitation to every one desiring to see a modern plant to visit their store.

Searchlight Carbons—Mr. Hugo Reisinger, of 11 Broadway, New York, the importer of the celebrated "Electra" carbons, has received a large order for searchlight carbons from the United States Government, to be used for the Navy as well as the United States lighthouses. Mr. Reisinger says that the government expert, who has given these carbons an exhaustive test, testifies to their high quality and efficiency, stating that the "Electra" searchlight carbons were the best they had ever been using, and expressed himself in the highest terms as to the results he obtained from them.

The Lorain Steel Company, of Lorain, Ohio, and Johnstown, Pa., has just issued a most sumptuous catalogue of its steel rails, frogs, crossings, switches, special work, trucks, etc., of which the ELECTRICAL REVIEW has received a copy through the courtesy of Mr. H. C. Evans, of the New York office of the company. It is a folio volume bound in cloth, and is one of the handsomest productions that Bartlett & Company have ever turned out. The 168 pages of text are enriched with drawings of great artistic beauty, but at the same time giving dimensions and other practical data. The Lorain Steel Company will be a large exhibitor at the forthcoming street railway convention.

Bullock Electric Manufacturing Company, of Cincinnati, reports sales for the month of September involving 61 machines ranging in size from 3 to 150 kilowatts. Among the more important were 15 engine-type generators for United States Army transports and ten 50-horse-power motors to operate at 200 revolutions per minute for Messrs. Dick, Kerr & Company, of London, England. Several repeat orders were received, among them being the following: Maryland Steel Company, Baltimore, Md., third order; Consumers' Park Brewery, Brooklyn, N. Y., third order; Atlas Cement Company, Northampton, Pa, fifth order; Missouri Lead and Zinc Company, Joplin, Mo., third order. When representative concerns, such as those named, find it to their advantage to continually add to their equipment of Bullock apparatus, it can mean but one thing, and that is, that the machines have given perfect satisfaction. A new bulletin, No. 0735, just issued by the company, describes Type "N" motors. This is the first bulletin of the standard 6 by 8-inch size which has been issued. Those interested in electrical literature will appreciate this reduction in size, as it is more readily filed than the larger pamphlets. It may be had by addressing the company at Cincinnati, Ohio.

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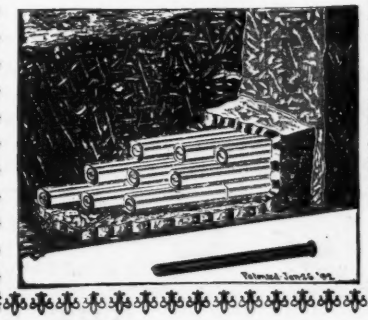

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Electrical.... Patents.

(Specially reported for this journal by E. S Duvall, solicitor of patents, Loan and Trust Building, Washington, D. C. Copies of any patent may be secured for 10 cents each.)

ISSUED OCTOBER 3, 1899.

634,187 Railway signal; J. Sargent, Rochester, N. Y.—Consists of a semaphore-blade, a horizontal shaft therefor, an operating-arm fixed on said shaft, a spring buffer connected to said arm, a motor connected to said buffer, and the abutment in the rear of said buffer, the shock of starting or stopping the semaphore being neutralized by the buffer.

634,198 Method of and means for preventing electric sparking; C. L. Buckingham, New York, N. Y.

631,220 Electric signaling apparatus for elevators; J. B. Smalley, Chicago, Ill.—A commutator for elevator-signaling apparatus comprising a screw-shaft, a nut engaging said shaft and carrying an oscillating brush-supporting arm, contact-plates arranged along the path of travel of said brush-supporting arm and a friction-block between said carrier-nut and said shaft.

634,226 Electric switch or signaling apparatus; Fred Andrews, Chicago—Comprises a movable contact-arm and means for shifting said arm back and forth in combination with means to engage the end of said contact-arm and so direct its movement in different paths, contact-plates arranged along said different paths of said contact-arm, and suitable means whereby said contact-plates and said contact-arm may be connected with the electric circuit.

634,227 Electric signaling device for elevators; C. G. Armstrong, Chicago, Ill.

634,229 Electric signaling apparatus for elevators; S. D. Collett, New York, N. Y.

634,231 Electric belt; L. A. Dixon, Marshall, Mich.

634,258 System for power transmission for electric traction; E. Bede, Brussels, Belgium.

634,286 Electric lighting system for cars; J. L. Creveling, New York, N. Y.—A circuit containing a dynamo, a storage battery, a make-and-break switch, and an electro-magnet, said dynamo having an energizing coil or coils in shunt across the mains between the generator and said switch, and a field energizing coil or coils in a derived circuit from the battery, a switch in said derived circuit operated by the electro-magnet in the main circuit.

634,295 Reflector for incandescent lamps; W. Goodchild, Wyoming, N. J.

634,314 Electric arc lamp; C. Tepel, Bennett, Pa.—A pivoted carbon-holder, a clutch lever pivoted thereto, and fulcrumed at a point farther from its connection with the carbon-holder than said carbon-holder is fulcrumed, a clutch, and a link pivotally connecting the clutch to the clutch lever.

634,315 Electric seam-calking tool; E. T. Thomas, New York, N. Y.

634,356 Electro-magnetic apparatus for separating ores; E. Kreuser, Mechernich, Germany.

634,381 Junction-box for manholes; J. W. Turner, New Orleans, La.—A manhole, a junction-box supported in the upper portion of said manhole, having wire connections accessible from the interior of the manhole, and provided with a cover allowing access to its interior from the exterior of the manhole.

634,403 Electrical apparatus for exhibiting and changing advertisements, signs or the like; A. D. Douglass, London, Eng.

634,430 Electric igniter for gas engines; W. H. Cotton, Chicago, Ill.

ISSUED OCTOBER 10, 1899.

634,467 Electrical influence machine; Karl S. Lemström, Helsingfors, Finland.

634,487 Electrical indicator; Montgomery Waddell, New York, N. Y.—The method of operating electrical indicators, which consists in determining the level of a liquid column by the flow of air or gas, and varying said flow in accordance with the variations of current.

634,488 Electrical indicator; Montgomery Waddell, New York, N. Y., and Charles Legrand, Westfield, N. J.

634,541 Electric starting device for gas engines; John W. Raymond, Oil City, Pa.

634,542 Electric lighting apparatus for railway cars; William F. Richards, Buffalo, N. Y.

634,568 Insulating support for electric wires; Carroll N. Beal, San Francisco, Cal.

634,575 Telephone system; Edwin W. Ham, Worcester, Mass.

634,623 Conduit railway; M. D. Law, New York, N. Y.—A conductor support, consisting of a base plate attached to the foot of the slot rail and capable of lateral adjustment toward and from the center of the conduit, and a slide attached thereto capable of longitudinal movement and carrying the electrical conductor.

634,654 Gas engine; George A. Whitcomb, Framingham, Mass.

634,666 Electric brake; G. H. B. Hooper, Toronto, Can.

634,667 Electro-magnetic cylinder engine; G. H. B. Hooper, Toronto, Can.

634,759 Crossing for underground conduits for electrical conductors; Victor Koch, Scranton, Pa.

634,767 Volt and amperemeter; J. D. Ross, Victoria, Can.—In an electric meter, two air-tight cylinders, a capillary tube connecting the two cylinders, a liquid in said tube, a gauge having fixed relation with the tube, and means for electrically utilizing or varying the pressure in the two cylinders.

634,804 Brush-holder for commutators; William Cooper, Cincinnati, Ohio.

634,811 Electric meter; Paul Ebbig, Berlin, Germany—An electricity meter, including a stationary coil or coils, oscillating levers carrying coils arranged to swing in the magnetic field of said stationary coil or coils, a directing or resistance mechanism tending to return said levers to a predetermined position, a separate clockwork connected with each of said levers.

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